JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania;

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

MARCH, 1829.

Observations on the connexion of Mechanical Skill, with the highest attainments in Science; being the substance of a lecture introductory to a course of Mechanics; delivered to the Franklin Institute, by the Editor, *January 24th*, 1826.

Without attempting to exhibit a scale of the relative excellence of associations, formed under the united influence of patriotism and benevolence, we may claim for our own a high station, and need not fear that our claims will be disputed. In its purview, it embraces one of the largest classes of men in every civilized community, a class upon whose operations is founded almost every thing which distinguishes a state of culture from barbarism, the philosopher from the savage.

To recount the operations of the mechanic, and to exhibit them as they contribute to the blessings of existence, would require the life of an antediluvian; excepting the products of nature in their unaltered state, every object upon which we can turn our eyes in the habitations of man, would present a subject for dissertation; a nail, or a pin, would furnish us with materials for a history; a history, in which its origin and progress would, in general, like that of nations, be found to defy the researches of the most industrious.

It has been imagined by some philosophers, that the first efforts of man in the arts were imitative, having been suggested by those of the brute creation. "It may be true," says lord Monbaddo, "that man first learned to build from the swallow, from the spider to weave, and from the birds to sing:" his lordship, however, was remarkable for a creative fancy, as is evinced by his imagining, in

one of his philosophical dreams, that, in the ourang-outang, we might discover our own progenitors. Mr. Pope in his Essay on Man, has presented us with a similar idea respecting the origin of the arts, where he says,

> "Go, from the creatures thy instruction take;
> Learn from the birds, what food the thickets yield;
> Learn from the beasts, the physic of the field;
> Thy arts of building, from the bee receive;
> Learn of the mole, to plough, the worm, to weave;
> Learn of the little nautilus, to sail,
> Spread the thin oar, and catch the driving gale."

The philosophy of the poet, and the poetry of the philosopher, are assuredly contradicted by observation and experience; those seem plainly to indicate that the common adage, which says that "necessity is the mother of invention," is a truism, which is felt and exemplified in the experience of every man, and in almost every hour of his life. In the earliest stages of society, the inclemency of the weather must have suggested the necessity of a shelter; the vicissitudes of the seasons, the use of some kind of covering for the body; and the employments of the chase, the formation of instruments for attack and defence.

Many of the arts, undoubtedly, originated in accident; the smelting of ores, the formation of glass, and the manufacture of pottery, were, probably, of the number. Whenever man had acquired a knowledge of the use of fire, its effects upon certain kinds of clay, exposed to its action, must soon have attracted notice; and an article so easily moulded into any form, could scarcely fail of being brought into use. The making of earthenware, probably, preceded the discovery of the metals, as it could be formed without their aid.

The art of working some of the metals, appears to have preceded the deluge; we could not, indeed, imagine such a vessel as the ark to have been built without their use. The metals first known, were, probably, found native; in which state they frequently exist on, or near, the surface of the ground, beneath which beds of ore are deposited. The accidental employment of fire in contact with some of their ores, was very likely to suggest the method of reducing them to the metallic state. In conformity with this idea, it has been asserted, that iron was discovered at an early period of Grecian history, by the burning of the forests of Mount Ida; and the knowledge of the silver mines of the Pyrennees, is attributed to a similar cause.

According to Pliny, the formation of glass, by the union of sand with the mineral alkali, was an accidental discovery. It is said that a vessel, loaded with the latter article, was cast on shore, and that the fires made by the mariners on the sand, caused the fusion of the alkali, and the earth, and thus produced glass; the hint thus given was pursued, and the useful and beautiful material became an article of manufacture.

It is not my intention in the present lecture, to pursue the inquiry into the origin of the useful arts, but to give to my observations a

more certain and practical direction, by noticing their application in the highest attainments of science. It is to the skill of the artisan that we are indebted for those accurate observations, which have made us so intimately acquainted with the mechanism of the heavens; and which have enabled us, practically, to solve that long propounded problem, the discovering of the longitude at sea. The history of the progress of astronomy, and of the improvements in navigation, would, also, be a history of the progress of mechanical skill; and, indeed, our most distinguished mechanics have become so, in consequence of their acquaintance with scientific principles; and our most distinguished philosophers have been, also, remarkable for their mechanical genius. A few examples will prove the correctness of these observations.

It was not until the year 1725, that any instrument was possessed by the astronomer which was worthy of particular notice, on account of its accuracy; at this period, a mural quadrant was made by Graham, a celebrated and scientific clock and watchmaker, in London; this instrument, made for the royal observatory, was unique in its kind, and still exists, a monument of the skill of the artist, who not only availed himself of the contrivances of his predecessors, but manifested his extraordinary genius, by inventing new methods for giving to his work that permanence, and accuracy, upon which its value depended.

In a few years after this, a self-taught artist of the name of Bird, became an able competitor of Graham. Bird was bred a weaver, and was led to turn his attention to the division of circles, by observing a common clock, upon the face of which the minutes were not accurately divided. Pursuing a happy train of thought on this subject, he was soon convinced that he had detected the causes of the errors in the methods which had been followed, and had discovered the means of correcting them; and although he went to London, unknowing and unknown, he was, in the course of a few years, reputably established as a mathematical instrument maker. These two artists, Graham and Bird, continued for many years, not only to supply instruments for their own country, but the philosophers of France, and the governments of many other countries acknowledged their superiority, by obtaining them for their surveys and observatories. Some idea of the excellence of their instruments may be formed, from the fact, that by them, the error in the going of a clock was ascertained to the fifth part of a second, nine observations out of twelve not differing more than one-tenth of a second from the mean result. So largely is astronomy indebted to these instruments, and to others since made, with many improvements by Ramsden and Throughton, that it is acknowledged that the single observatory, at Greenwich, has done more for the improvement of astronomy, than all the other observatories of Europe taken together. Baron De Zach, speaking upon this subject, observes, "if any one should assert that our astronomical tables would be equally perfect, if the other *hundred and thirty* European observa-

tories had never existed, he would be very well able to support his assertion."

Whilst the mechanic has thus given value to the observations of the astronomer, enabling him, by his accurate divisions of space, to ascertain the positions of the heavenly bodies, within the $\frac{1}{3600}$ part of a degree, navigation has derived equal advantages, from the perfection with which chronometers, or instruments for marking the divisions of time, have also been made. We cannot now trace their history, but will cite an example of their surprising accuracy. Four time keepers, of this kind, made by Parkinson and Frodsham, of London, were taken by Capt. Parry to the polar regions, where they were exposed to a degree of cold 87° below the freezing point; upon his return, after an absence of 18 months, the greatest error was only 7 seconds in time; and the mean error of the whole four, under two seconds; these, therefore, must have enabled them to discover their longitude, within a few hundred yards, leaving nothing further to be desired in this particular.

Newton, whose name is associated in our minds with every thing that is great and excellent in science generally, but particularly in astronomy, delighted, in early life, in mechanical pursuits. "It is recorded of him, that while at school, his thoughts ran more on practical mechanics, than on his regular exercises; and that during those hours of recreation, which the other boys devoted to play, he was busy with hammers, saws, and hatchets, constructing miniature models, and machines of wood. Among his first efforts was a wooden clock, kept in motion by water, and telling the hours on a dial plate at the top. He made kites, to which were attached paper lanterns, and one of his favourite amusements, was, flying them in the night, to the consternation of the neighbouring inhabitants. He fabricated tables, and other articles of furniture, for his schoolfellows, and is said to have invented and executed, a vehicle with four wheels, on which he could transport himself from one place to another, by turning a windlass."

After he had completed his collegiate studies, was ardently engaged in his experiments on light and colours, and had commenced his observations on the heavenly bodies, he employed himself in various attempts to improve the telescope, and ground a great number of lenses, inventing a variety of methods for giving to them the forms which he desired, and by which he expected to remove the imperfections of that instrument; when foiled in this attempt, he had recourse to the principle of reflection, and with his own hands, manufactured two reflecting telescopes, the first of which is still in the possession of the Royal Society. To polish the metallic mirror, is, even at the present day, an operation successfully performed by very few mechanics; yet this, Newton accomplished in the most perfect manner, and the method which he invented, of giving the highest polish without injury to the perfection of the surface, by finishing, on a tool covered with pitch, was one of those happy thoughts which are born of superior genius alone. This method is still followed, nor is it likely that another, equally good, will ever be devised.

James Ferguson, who from a very humble station in life, became, by his genius, and industry, a practical philosopher of distinguished reputation, first attracted attention, when only 7 or 8 years of age, by constructing machines to illustrate the properties of some of the mechanical powers, of which he imagined himself to be the inventor; he made a wooden clock which is said to have kept tolerable time. Having seen the description of a globe, in a book borrowed from a neighbour, he constructed one of sufficient accuracy to enable him to work all the ordinary problems. He attempted to make a watch, with wheels of wood, and a whalebone spring, having no other intimation of its structure, than that obtained from a gentleman who was passing along the road near the house of his father, and who, observing his anxious curiosity, showed him the inside of his watch, and explained to him the principle upon which the spring gave it motion. Notwithstanding the materials of which young Ferguson's watch was constructed, were too rude to allow it to go, it served to prove his extraordinary patience and skill. Although he is not entitled to rank as a first rate genius, he became a distinguished lecturer on astronomy and natural philosophy, and was for some time the instructer of the late king of England, on those subjects. He published many works, which are still esteemed for a peculiarly familiar and perspicuous style, derived in a great degree from his skill in mechanics, which he happily applied to the illustration of philosophical principles.

We have already remarked, that Sir Isaac Newton was led to the invention of the reflecting telescope, from the difficulties which presented themselves in his endeavours to remove the defects of the refracting telescope. Many attempts were subsequently made by other philosophers with the same view; but the honour of complete success was reserved for Mr. John Dolland, who has immortalized his name by the invention of the achromatic telescope. Dolland was the son of a weaver in London, and in the early part of his life worked at the loom; but his mind was given to the pursuit of the mathematics and natural philosophy, and all his leisure hours were devoted to study, or to the construction of sun dials, and other instruments of science. By great industry, and by abridging the ordinary periods of repose, he acquired a considerable stock of general learning, became a practical optician, and commenced the business of manufacturing instruments: he introduced many improvements in their construction, and has, probably, brought the refracting telescope to the highest possible degree of perfection. His success in business was equal to his merits; his name was enrolled among those of the most distinguished philosophers in several learned societies; he was appointed optician to the king; and was as highly respected for his moral worth, as he was admired and honoured for his genius and talents.

Sir William Herschell was by profession a musician, but being passionately fond of the sciences of optics and astronomy, in order the more fully to pursue these subjects, he attentively studied the theory, and busied himself in the practice of mechanics; particularly

in the grinding and polishing of lenses and reflectors, for telescopes, and other apparatus applicable to astronomical observations. Such was his industry, that with his own hands he ground and polished more than 400 speculæ; some of them of extraordinary size; and although in the nice operation of casting them of such dimensions as had not, heretofore, been attempted, he encountered numerous difficulties, and suffered many severe disappointments, he persevered with unabated zeal, and in the year 1781, by the aid of one of his own telescopes, discovered the planet which now generally bears his name. This event rewarded him for all his past labours, and stimulated him to fresh exertions. The attention of Europe was turned towards him, his sovereign allowed him an annuity, and in a few years after, he finished his telescope of 40 feet in length, and nearly 15 feet in circumference, with a reflector 49 inches in diameter, which, when cast, weighed 2118 lbs. This immense tube of sheet-iron, with its ponderous appurtenances, he suspended with great mechanical ingenuity, so that it can with facility be directed towards any part of the heavens.

He was enabled by this instrument, which far surpassed all others in power, to enrich astronomy with numerous discoveries and observations, enlarging the boundaries of science, increasing his own fame, and augmenting the glory of his country.

One of the most striking examples of what may be accomplished by a powerful mind, unaided by the advantages of education, but dependant solely on the resources of an extraordinary genius, in which intuition seems to outstrip the march of science, is exhibited in the life of James Brindley. His education had been neglected in consequence of the imprudence of his father, and he was compelled to perform that kind of labour which falls to the lot of the poorer class, until he was 17 years of age. He then bound himself apprentice to a mill-wright, and at a very early period of his service, became the instructer of his master, and was preferred to him by his employers, when any thing was to be performed which was new, or difficult. Whatever he undertook, he accomplished; leaving on all his works the evidences of his superiority, in the improvements which he introduced. At the period when his skill, as a mechanic and engineer, had become extensively known, no canals of any great extent, or importance, had been constructed in England. About the year 1758, the duke of Bridgewater was desirous of extending one from the coal mines on his estates, to Manchester, about seven miles distant, and which, if accomplished, must be carried over rivers and deep vallies, and through subterraneous tunnels. Brindley surveyed the ground, and declared the work practicable; and although assailed by ridicule on almost every side, such was the duke's confidence in the talents of his adviser, that he determined upon its execution. When the canal had been completed as far as the river Irewell, (which is navigable for large vessels) and Brindley proposed to cross it by an aqueduct, elevated 39 feet above the surface of the water, an eminent engineer who was consulted on the occasion, observed, that he had "heard of castles in the air, but had

never before been shown where any of them were to be erected." In ten months after this, the aqueduct was completed, and the first boat passed through this air-built castle, whilst the vessels in the river pursued their ordinary course. The accomplishment of this undertaking established the credit of Brindley on an immoveable basis; the duke extended his canal to Liverpool, and the success of his efforts caused many others to be immediately planned. In the execution of these, the services of Brindley were anxiously sought for, and always rendered with the same results which had accompanied him in his former works.

When difficulties occurred which he could not readily overcome, he neither resorted to books, or to the labour of others; but retiring to his bed, secluded himself completely, until his plans were matured; and when his own mind was satisfied, success appeared to follow as a thing of course. He never, for his own use, drew any of his plans on paper, but made the most abstruse calculations in his mind, arranged all the parts of his most complex machines, and retained the whole in his memory, which his habits had rendered vigorous, to a surprising degree. He died in his 56th year, leaving behind him a character for integrity, as spotless as his genius was great; having accomplished more during the time of the comparatively short period which he devoted to internal improvements, than would have appeared possible, but for the testimony of his works.

[TO BE CONTINUED.]

ENGLISH PATENTS.

Specification of the patent granted to BENJAMIN COOK, *for a certain Mixture or Preparation, which may be used with advantage, in preventing the danger of accidents from Fire.* Dated April 16, 1822.

I THE said Benjamin Cook, do describe and ascertain the nature of my said invention, and in what manner the same is to be performed; that is to say: I render all sorts of timbers, calicoes, cottons, silks, muslins, cloth, and linen of every description, incombustible, by the use of a mixture, or preparation, and thereby prevent accidents from fire; (namely) I take the two fixed alkalies, which I dissolve in water, in such proportions as I find necessary; if I require a very strong solution, I give to the alkali such quantity of soft water as it will take up to render it liquid, and of a consistency suitable for my purpose; such, for instance, as saturating of timber for most uses. I prefer the pure fixed vegetable alkali, which I disengage from its impurities, and then dissolve it in soft water, and by this plan I obtain a solution suitable for rendering calico, cottons, muslins, silks, cloths, and linen of every description, incombustible. The strongest solution which I can obtain from the pure

fixed vegetable alkali, is what I prefer for rendering timbers incombustible. Into this solution I put all timbers in the plank, in which situation they must lie till the alkaline solution has penetrated through the plank; a few weeks will generally effectuate this. I prefer using a very strong solution, but a much weaker one will render timber incombustible; that is to say, to every one hundred weight of alkali put twenty-five gallons of water; the strength of the solution I vary as I find needful, and according to what it is applied.

If I wish to render scenes of theatres, floors of rooms, or any other wood-work incombustible with a strong solution, I pass over every part with a brush four or six times, letting it dry between each time, when the pores of the timber will become saturated with the alkali, or the surface of the thing so passed over will be covered with the alkali, and prevent any accident from fire; but, for ship timbers, and, indeed, all timbers upon a large scale, I would saturate the tree with alkali at once, as it is fallen, and before it is barked, by means of an engine to extract or force out the sap; then to saturate the whole by forcing the alkali through all the pores of the tree, after which, it may be barked and sawed up into planks when required. All parts of vessels already built, if regularly washed and saturated with a strong alkaline solution, as herein set forth, will be rendered perfectly incombustible, so that ships at a very small expense may be preserved from the possibility of being injured by fire, either accidental or intentional. For rendering all sorts of calicoes, cottons, silks, muslins, cloth, and linens of every kind, incombustible, I make a weak solution of the vegetable alkali in the purest state I can obtain it, and as alkali produced from some vegetables is stronger than others, the simple mode I adopt, is, to keep adding alkali to the water until cotton, paper, or linen, dipped into it and dried, will not blaze; it will char by intense heat, but not inflame; for calicoes, cottons, silks, muslins, cloths, and linen, I prefer the solution as weak as it will allow, to prevent inflammability; but this solution, after it is made, should stand for a week or more, that all the impurity possible may settle at the bottom; it should then be drawn off into a clear earthen vessel, and again be suffered to stand for a month or six weeks, corked up in a heat nearly sufficient to produce evaporation, occasionally trying its purity by putting a portion of it into a clean flint-glass bottle holding about a pint, in order to ascertain by its clearness when it is fit for use. Before it is quite clear and proper for use, there will, generally, appear in it very thin transparent laminæ floating about, which will gradually sink to the bottom, leaving the solution as clear as the purest water, so as not to discolour the finest linen; it is then in a proper state ready to draw off into clean vessels for use. The articles to be rendered incombustible, such as wearing-apparel, bed-furniture, window-curtains, or any other articles made of cotton, linen, silk, muslin, or cloth, should, after they are washed and wrung as dry as can be out of the last water, be dipped into the solution and wrung out as dry as possible, then dried and ironed, or mangled in the usual way.

In my patent I claim the exclusive privilege for the application of the fixed alkalies in a mixture or preparation, which will prevent the danger of accidents by fire; but I here wish to remark, that while I render timbers incombustible, by extracting the sap, and saturating or filling up the pores with alkali, such timbers are not only rendered incombustible, but are also preserved from the dry-rot, as no timber so prepared will be affected by dry-rot. To the navy, and all public and private buildings, this is most important.

There are thus three great principles in the application of my discovery, of which I claim the exclusive privilege;

First, the application of the fixed alkaline solution in preventing all accidents from fire to calicoes, cottons, silks, muslins, cloth, and linen of every description, bed and window-curtains, and sail-cloths;

Secondly, its application to prevent, effectually, all wood-work of all sorts, either in buildings or vessels, of any description, from being destroyed by fire, either by accident or intention;—and,

Thirdly, the process used to render timber incombustible, will, at the same time, completely prevent the dry-rot from ever affecting such timber so prepared under my patent.

Specification of the patent granted to Robert Ford, *Chemist, for a Chemical Liquid, or Solution of Annotto.* Dated April 24, 1822.

To make twenty gallons of the chemical liquid, or solution of annotto, I take fifty-six pounds of annotto, more or less. I reduce it with warm water. Then I pass it through a fine sieve: let it stand seven days, or longer. Then I add the leys of subcarbonated potash; a sufficient quantity to produce the colour required. The quantity, and, also, the strength, must depend on the colour it is intended to produce, and, also, on the quality of annotto. (Other suitable articles may be used for this purpose.) Then I add to the above about six pints of the aqua lixivium caustic, more or less. Then I take alcohol, one hundred and ninety-two ounces, and mix the whole together, keeping it in a closed vessel.

I further declare, that as my invention consists in producing a liquid or solution of annotto, an article I believe to be entirely new, I shall consider any similar production, whether from different articles, or variation of quantity of the aforesaid articles, or by what means they are produced, as an infringement on my patent-right, as every chemist must be aware that there are ingredients other than those mentioned above, which may with effect be made to supply their, or either of their places.

Specification of the patent granted to JOHN BOURDIEU, ESQ. *for a Discovery and Preparation of a Mucilage, or thickening matter, to be used in Printing or Colouring Linen, Woollen, and Cotton Cloths, and Silks, in cases in which Gums, Mucilages, or other thickening matters are now employed. Communicated to him by a foreigner residing abroad. April* 29, 1823.

I THE said John Bourdieu, do hereby declare that the nature of the said invention, and the manner in which the same is to be performed, are particularly described and ascertained, in and by the following description thereof; that is to say: the mucilage or thickening matter to be used in printing or colouring linen, woollen, and cotton cloths, and silks, in cases in which gums, mucilages, and other thickening matters are now employed, is made from the grain or seed which is found in the fruit or pod of the tree, called in English, "carob tree," or "Saint John's bread;" in French, "Caronbier." This grain or seed may be used in any manner by which its mucilaginous parts or properties can be applied in the operations of printing and colouring above referred to. The mode which the person who informed me of the discovery thinks is best adapted to this end, is as follows: when the fruit or pod of this tree is ripe, the grain or seed is to be taken out of it by cutting, thrashing, friction, or by a mill, or in any other manner which may be found convenient. The seed when separated from the fruit or pod, is to be cleansed from the pulp or flesh which may adhere to it; this may be done by washing, drying, scraping, or friction, or in any other manner which may be found convenient. The seed is to be very finely pulverized by any process adequate to effect the operation; it may be done by the pestle and mortar, or by a mill, or by the methods used in the pulverization of drugs and substances of a hard nature, for medicinal or chemical purposes. As the pellicle, or skin, forms about one-tenth part of each seed, and is not mucilaginous, it will be desirable that the seed should be divested of it before the operation of pulverizing is commenced. The method to be pursued to get rid of the pellicle or skin, is to steep the grain in sulphuric or other corrosive acid, till the pellicle or skin is so carbonized that it will slip off or leave the seed; this usually takes place, in good sulphuric acid, in about six hours, and the effect of the process may be judged of by taking out from the acid some of the grains, from time to time, in order to find whether the destruction of the pellicle is completed; this may be ascertained by immersing some of the seeds in water, and then rubbing them between the thumb and fingers. When the pellicle is sufficiently carbonized or destroyed, the seed is to be taken out of the sulphuric acid and washed in water, and then the skin will be easily got rid of by stirring it about in the water, or the seed may be dried and then rubbed in cloths, or shaken in sacks or sieves; by either method the skin will be removed. The seed must be dried before the operation of pulverizing commences. The carob

seed, when reduced to a fine powder, is to be used in the various operations of printing and colouring linen, woollen, and cotton cloths, and silks, in the same manner as flour and starch are now respectively mixed, and used as thickening matter in such operations, with this difference, that the carob seed should be kept in a boiling state with the liquid to be thickened, for a space of from thirty to forty minutes, according to the heat of the fire. The quantity of carob seed which is necessary for each operation, is to be regulated according to the degree of consistence which may be required; the quantity will be different, according to the different mordants, and the different modes of impression or colouring to which it is to be applied. The workman must, according to the work to be done, ascertain the degree of consistence required to be produced by the carob seed, in the same manner as the degree of consistence required to be produced by gum Senegal, or other thickening matters, is now ascertained; and it is necessary to observe, that in all cases in which carob seed is used, without having been first divested of its pellicle or skin, whether applied as a substitute for gum or for other thickening matters, the mordants and colours prepared with carob seed ought to be of rather a thicker consistence than would be requisite for a mordant or colour for a similar operation, when such mordant or colour is thickened by or used with gum Senegal; but when used after the pellicle or skin has been removed, its consistence must be the same as when such mordants or colours are thickened by, or used with, gum Senegal. In general, it will be found, that when the pellicle is not removed, one pound of carob seed should be used, where about eight pounds, or from eight to about nine pounds of gum Senegal are now required. In cases where the pellicle or skin has been detached from the carob seed, about one pound of carob seed should be used, where about nine pounds, or from nine to ten pounds of gum Senegal are now required.

On giving Magnetic Power to Iron or Steel, and on completely freeing those Substances from Magnetism, by hammering them while in certain positions. Abridged from the Edinburgh Philosophical Journal.

Dr. Gilbert, two hundred years ago, discovered that iron made red hot, and then drawn out by hammering, while placed in the magnetic meridian, became magnetical. Mr. Scoresby has ascertained that a horizontal position in the magnetic meridian was by no means the best position for the development of magnetism by percussion; but that the position of the dipping-needle given to bars of iron, when hammered, produced the highest effect. A single blow with a hammer on a bar of soft iron, held vertically, was found to be capable of giving it a strong magnetic action on the compass, the upper end becoming a south pole, and the lower end a north pole: on inverting the bar, another blow was found sufficient to change

the polarity formerly given to it. But one of the most important effects of percussion observed by Mr. Scoresby, was found to be this, that a blow struck upon any part of a bar of iron, while held in the plane of the magnetic equator (which is horizontal E. and W., or with the north end elevated about 19 degrees above the horizontal line in this country,) has an invariable tendency to *destroy* its magnetic action, which it generally does so effectually as to prevent its exerting any influence over a compass, when presented to it in the same plane of the magnetic equator.

Previously, no other method was known of freeing iron or steel completely from magnetism, but that of heating it red hot, and allowing it to cool in a horizontal position, east and west. This process, however, besides spoiling the surface of the metal, is troublesome, and seldom completely effectual in its application. But the same object is accomplished in a moment, and with infinitely better effect, by Mr. Scoresby's process, merely by a slight blow or two with a hammer, while the iron or steel is held in the magnetic plane, and is equally applicable to very large and heavy bars. Grinding, filing, polishing, drilling, turning, twisting, bending, &c. were all found to elicit magnetic attraction, when performed in a vertical position, or any position out of the magnetic plane; but the same processes were destructive of polarity, when performed on a bar or plate of untempered metal, while held in the plane of the magnetic equator. Hence, the magnetism of steel chronometer balances would, no doubt, be prevented, and even destroyed, if they had previously obtained it, by turning them into form, and polishing them in the plane of the magnetic equator.

Mr. Scoresby found that soft steel received the greatest degree of magnetic energy by percussion. In soft iron, the magnetism was strong, but evanescent; in hard steel and cast-iron, weak, but permanent. Magnetism in steel being more readily developed by the contact of magnetizable substances, and particularly if these substances be already magnetic, it was found that the magnetizing effects of percussion were greatly increased, by hammering the steel bar with its lower end resting on the upper end of a large rod of iron or soft steel, both the masses being held in a vertical position, and especially if the rod were first rendered magnetic by hammering. Mr. Scoresby found that small or slender bars acquired a much greater lifting power, in proportion to their weight, than large bars. There was an increase of attraction in bars of the same diameters, when the lengths were increased. The quantity of magnetism developed by this process, was increased by a frequent repetition of the experiment with the same bars.

Mr. Scoresby being desirous of applying the process to the construction of powerful artificial magnets, prepared six bars of soft steel, and bars properly tempered, suitable for a large compound magnet. The soft steel bars were nearly eight inches long, half an inch broad, and a sixth of an inch thick. The bars for the compound magnet, seven in number, which were of the horse-shoe form, were each two feet long before they were curved, and eleven inches

from the crown to the end; when finished, one inch broad and three-eighths thick. These bars were combined by three pins passing through the whole and screwing to the last; and any number of them could be united into one magnet, by means of a spare set of pins screwed throughout their length, and furnished with nuts. In addition to these bars, &c. he provided separate feeders, or conductors, of soft iron, suitable for connecting the poles of each of the bars of the compound magnet, and also another conductor fitted to the whole when combined. To communicate the magnetic virtue, a rod of soft steel was hammered for a minute or two, while held vertically upon a large bar of soft iron in the same position: this gave considerable magnetism to the steel rod. Every one of the six bars of soft steel was then hammered on the top of this steel rod, until the accession of lifting power ceased. Then fixing two of them on a board, with their different poles opposite, and formed by a feeder at each end into a parallelogram, these were rubbed after the manner of Canton, by means of the other four bars, and thus their magnetism was greatly augmented. The other four bars were operated upon in pairs, in a similar way, those already strengthened being used for strengthening the others, and each pair being successively changed, until all the bars were found to be magnetized to saturation. A pair of them now possessed a lifting power of two pounds and a half.

The next step was to touch the bars intended for the compound magnet, by means of these six bars now magnetized. For this purpose the six bars were combined into two magnets, by tying three of them together with similar poles in contact; these two were then placed with opposite poles in connexion, and tied together at one end, but separated about the third of an inch at the other, so as to form one compound magnet, and a conductor was kept constantly applied to the open end of it when not in use, to preserve the power from being lost. One of the bars of the horse-shoe magnet, with a conductor placed across the poles, was now placed on a board, in a groove cut out so as to hold it fast under the operation. The straight bar magnet was then placed erect on the middle of it, with the separated poles downward, and rubbed against the horse-shoe bar from the middle to one of its poles, until the north pole of the one was in connexion with the pole intended to become south of the other; from thence it was rubbed back again, with the south pole of the magnet in advance, as far as the other extremity, or that intended for the north pole of the horse-shoe bar. Two or three strokes of this kind being made from end to end of the bar, on each side of it, the south and north poles of the magnet being always directed to the south and north poles of the bar respectively, the magnet was slipped sideways off when at the pole of the bar, and the bar was found to have acquired such a magnetic power as to enable it to sustain a weight of several ounces hung from the conductor. Each of the bars of the horse-shoe magnet was treated this way in succession, and then the first five bars of the magnet being combined by the screws, were employed in the same way as the soft

steel magnet had been used, for increasing the power of the sixth and seventh bars, by which they were rendered capable of carrying above two pounds weight each. These were then substituted in the combined magnet, for the fourth and fifth bars, while the latter underwent the touch of the other five in combination, and in their turn, the second and third, and then the seventh and first, were subjected to similar treatment. After these operations, which occupied 43 minutes, the compound magnet, with all the seven bars in connexion, lifted ten pounds; after a second series of the same kind of manipulations, five of the bars in combination carried fifteen pounds; and after a third series, eighteen pounds; but as, on trying a fifth series, little augmentation took place, the process was discontinued. The whole of the operations, from beginning to end, occupied above four hours; but as each bar was generally rubbed with twelve strokes on each side, instead of one or two, which were afterwards found to be sufficient, and in other parts of the process a great deal of time and labour were spent, which turned to no account; no doubt but the whole might have been completed, beginning without the smallest perceptible magnetism, and ending with a lifting power of twenty or thirty pounds, in the space of two hours or less. As steel does not receive, immediately on being touched, the full degree of magnetic energy of which it is susceptible, a conductor was applied to the magnet now formed, and it was laid aside, with the view of augmenting its power on a subsequent occasion. [*Rep. of Arts.*

On Improvements in the Art of Engraving on Steel. By Mr. C. Warren.

[From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.]

The death of Mr. Warren, in the interval between the adjudication of the medal and the day of annual distribution of the rewards, prevented the society from receiving a written communication on this interesting subject, from the inventor himself. The following statement, therefore, is taken from the report of the committee to the society, and from details communicated by Mr. Warren's personal friends, especially by Mr. Joseph Phelps, who was pupil to Mr. Warren during the whole progress of his experiments and discoveries.

Some of the earliest specimens of engraving on steel, were produced by Albert Durer. There are four plates etched by this artist, impressions of which exist in the British Museum, which, in all books of art, are recorded as having been executed in steel; of these, one has the date 1510 inscribed on it. Since that time, attempts have been made, occasionally, to employ steel instead of copper, as a material to engrave upon, but, apparently, with little success, on account, principally, of the great hardness of the material, which, in a short time, blunted and destroyed the tools which were made use of.

Steel exists in two states, the elastic and the brittle, the former being considerably softer than the latter; of the elastic steel, a saw-blade may be considered as an example, and, in fact, pieces of saw-blade were the material upon which nearly all the first attempts have been made, of late years, to revive a practice, which, if successful, offered so many advantages to the artist and to the public. Mr. Raimbach, a few years ago, executed an engraving on a block, or thick plate of steel, but met with so many difficulties in the execution, that his experiment remained insulated, and produced no sensible effect on the art of engraving.

Mr. Warren, in his early youth, was much employed in engraving on metals for the use of calico printers and gun-smiths; and the experience thus acquired, induced him, afterwards, to turn his mind to the subject, with a view of applying it to the fine arts. It was suggested to him, by Mr. Gill, one of the chairmen of the committee of mechanics, that the method employed by the artists of Birmingham, in the manufacture of ornamented snuffers, and other articles of cast-steel, is, to subject the steel, after having been rolled into sheets, to the process of decarbonization, by means of which it is converted to a very pure soft iron; being then made into the required instrument, or other article, the ornamental work is engraved, or impressed, on the soft metallic surface; after which, by cementation with the proper materials, it is again converted, superficially, to steel, and thus rendered capable of acquiring the highest degree of polish.

In the attempt, however, to apply this process to plates for the engraver's use, two opposite difficulties occurred. A plate of steel, of the same thickness as that of common copper-plate, when thoroughly decarbonized, and thus reduced to the state of very soft iron, yields readily to the graver and other tools, and, especially, is susceptible of the process of *knocking-up;* this consists in scraping out the error, and afterwards striking the under side of the plate with a punch and hammer, in order to raise the cavity to the general level, and thus allow the artist to take the error out without occasioning any unevenness of the engraved surface: it was found, however, that plates of the thinness requisite for this operation, and of the usual superficial dimensions, were very liable to warp in the last, or re-carbonizing process, and were thus rendered incapable of giving perfect impressions. If, in order to avoid this disadvantage, blocks, *i. e.* plates of three or four times the ordinary thickness, were made use of, the warping, indeed, was prevented, but, at the same time, the process of knocking up became impracticable, and it was necessary, in order to remove an error, or defective part, to grind out the surface, or to drill a hole from the under surface almost through the plate, and then, by forcing in a screw, to raise that part of the face which was immediately above it. This latter process, however, was so tedious and difficult, as exceedingly to detract from the advantage of substituting steel for copper.

In this state of things, it became a very interesting object of inquiry, to ascertain how many impressions may be taken from a plate of soft or decarbonized steel; and it was found that such a plate,

prepared according to Mr. Warren's process, is capable of affording several thousand copies without undergoing any sensible wear. In proof of this, impressions were laid before the committee, by Mr. Warren, from two plates of decarbonized steel executed by him, the one for an edition of Mackenzie's works, published by Cadell, the other for an edition of Beattie and Collins, published by Rivington. These exhibit, both in the landscape and in the figures, the most elaborate and delicate work: five thousand impressions have been taken from one, and four thousand from the other; and yet between one of the first and one of the last impressions it was impossible to detect any perceptible difference.

If Mr. Warren had carried on his experiments alone, working by himself till he had brought his plan to perfection, it is probable that, at the period of his death, the evidence of the great importance of his discovery would by no means have been so complete as it actually was; and the result of his exertions might have been lost, to the great detriment of the profession, and of the fair fame of this eminent artist. But selfishness and secrecy in any thing which related to the improvement of the art to which he was attached, formed no part of his character; and all his discoveries, both those relating to the preparations of the plates, as well as those which have reference to the engraving upon them, were unreservedly and gratuitously communicated. The consequence of this liberality was, that besides the plates of Mr. Warren's own engraving, produced before the committee, impressions were shown of portraits engraved on decarbonized steel for the Evangelical Magazine, demonstrating that, after 25,000 copies have been taken, the plates still remain in a good state, and are not yet in want of repair. Mr. Mar stated, that having made an engraving on one of Mr. Warren's plates, he did not take his own proofs till after the 8000th impression; and, in another instance, the engraving being a portrait, Mr. La Hie, the printer, certified that the artist's own proofs were not taken off till after the 20,000th impression.

Mr. Warren's original process for decarbonizing the steel plates, consisted in procuring a box, or case of iron, and covering the bottom of it with a mixture of iron turnings and pounded oyster-shells; on this a steel plate is laid, another bed of the mixture is then added, and so on alternately, till the box is full, taking care that a bed of the composition shall form the upper as well as the lower layer. The box so charged is then to be placed in a furnace, and to be kept for several hours at the highest heat which it will bear, without melting, after which, being allowed to cool gradually, the plates are found to be reduced, for the most part, to the state of soft decarbonized steel.

Mr. Hughes, a copper-plate maker, having been instructed by Mr. Warren in his process, and finding that the steel did not always turn out sufficiently and uniformly soft (particularly for the purpose of engravers in mezzotinto,) imagined that those occasional defects were owing to a deficiency of heat in the cementing process; accordingly, he substituted a case, or oven, of refractory clay, for the cast-

iron one, and then, applying a considerably higher heat than the cast-iron box would have endured without melting, was enabled to obtain plates so soft, that they may be bent over the knee. Each plate requires two or more cementations; and, as the first cementation warps them more or less, Mr. Warren was in the habit of rectifying them by means of a hammer. Mr. Hughes finds that the places struck by the hammer are apt to be less softened by the second cementation than the other parts, and, therefore, that plates so treated will often turn out unequal in hardness. His own practice is to use a mallet, and as little force as possible, in detaching the cement from the surface, and in rectifying the plate.

The plate being cleaned and polished (but not too highly,) is ready for the engraver. When it comes into his hands, the first operation is, to lay the etching-ground; in doing which, the plate must be rather less heated than is usual with copper, otherwise the ground, as it cools, contracts, presenting a honey-combed surface, and leaving parts of the plate uncovered. The same defect is apt to occur if the plate is too highly polished. The ground should be laid rather thicker than on copper.

Various menstruums were made trial of by Mr. Warren for biting in with. Nitric acid, considerably more diluted than for copper, was made use of, with, upon the whole, good success. Nitrate of mercury was found to blunt or round the edges of the lines: acetic acid, with a small portion of nitrate of copper, produced the same effect: sulphate of copper, bit light tints very beautifully, but its further action rendered the lines rough. The best menstruum, however, is half an ounce of crystallized nitrate of copper, dissolved in a pint and a half of distilled water, and a few drops of nitric acid added to the solution. This will be found to bite both deeper and clearer than dilute nitric acid.

It will be adviseable for the artist, when first etching on steel plate, to keep a register of the time which he finds necessary for the menstruum to act before the parts have attained their due degrees of strength, and this will serve as a guide to him in his subsequent operations. Mr. Warren generally found about two minutes sufficient for an outline, unless it was required to be very strong; the middle tint was produced in about ten minutes, and the darkest shadows in forty minutes. The menstruum should not be more than one-sixth of an inch deep on the plate, otherwise it will be difficult to see the work, and it becomes exhausted in about ten minutes, and then requires to be replaced. While the menstruum is acting, the work must be constantly swept with a camel-hair brush, in order to remove the precipitated copper, which, if allowed to remain in the lines, renders their edges rugged, and destroys their beauty: especial care must be taken to clear the ends of the lines, as these are most liable to bite foul. In stopping out, the ground (Brunswick-black) must be laid on very thin and even, and instead of terminating abruptly, must be smoothed off very gradually; for the smallest ridge or prominence will retain the copper, and then the ground will infallibly be penetrated, and the biting will become foul. By attend-

ing to these directions, an etching may be obtained on decarbonized steel, as deep, and quite as sharp, as it can be on copper.

Concerning the great superiority of steel-plate over copper-plate, for all works that require a considerable number of impressions to be taken, there can exist no doubt: for though the use of the graver, and of the other tools, requires more time on steel than on copper, and though the process of re-biting has not yet been carried to the degree of perfection in the former that it has been in the latter, yet the texture of steel is such, as to admit of more delicate work than copper; and the finest and most elaborate exertions of the art, which on copper would soon wear so as to reduce them to an indistinct smeary tint, appear to undergo scarcely any deterioration on steel; even the marks of the burnisher are still distinguishable after several thousand impressions.

Both the public and the artist are eminently benefitted by this discovery; the public, by having a multitude of impressions as good as copper-plate proofs, and the artist, in greatly extending the range of his reputation by the permanence thus given to the finest and most characteristic touches of his hand.

On the General Nature and Advantages of Wheels and Springs for Carriages, the Draft of Cattle, and the Form of Roads. By Davies Gilbert, Esq. F. R. S. &c.

Taking wheels completely in the abstract, they must be considered as answering two different purposes.

First, they transfer the friction which would take place between a sliding body and the comparatively rough uneven surface over which it slides, to the smooth oiled peripheries of the axis and box, where the absolute quantity of the friction as opposing resistance is also diminished by leverage, in the proportion of the diameter of the wheel to that of the axis.

Secondly, they procure mechanical advantages for overcoming obstacles in proportion to the square roots of their diameters, when the obstacles are relatively small, by increasing the time in that ratio, during which the wheel ascends: and they pass over small transverse ruts, hollows, or pits, with an absolute advantage of not sinking, proportionate to their diameters, and with a mechanical one as before, proportionate to the square roots of their diameters.

Consequently, wheels thus considered, cannot be too large: in practice, however, they are limited by weight, by expense, and by convenience.

With reference to the preservation of roads, wheels should be made wide, and so constructed as to allow of the whole breadth bearing at once; and every portion in contact with the ground should roll on it without the least dragging or slide: but, it is evident from the well-known properties of the cycloid, that the above conditions cannot unite, unless the roads are perfectly hard, smooth, and flat;

and unless the felloes of the wheels, with their tires, are accurately portions of a cylinder. These forms, therefore, of roads and of wheels, are the models towards which they should always approximate.

Roads were, heretofore, made with a transverse curvature, to throw off water, and in that case it seems evident that the peripheries of the wheels should, in their transverse sections, become tangents to this curve, from whence arose the necessity for dishing wheels, and for bending the axes; which contrivances gave some incidental advantage for turning, for protecting the nave, and by affording room for increased stowage above. But recent experience having proved that the curved form of roads is wholly inadequate for obtaining the end proposed, since the smallest rut intercepts the lateral flow of the water; and that the barrel-shape confines carriages to the middle of the way, and thereby occasions these very ruts,—roads are now laid flat, carriages drive indifferently over every part, the wear is uniform, and not even the appearance of a longitudinal furrow is to be seen. It may, therefore, confidently be hoped that wheels approaching to the cylindrical form will soon find their way into general use.

The line of traction is mechanically best disposed when it lies exactly parallel to the direction of motion, and its power is diminished at any inclination of that line in the proportions of the cosine of the angle to the radius. When obstacles frequently occur, it had better, perhaps, receive a small inclination upwards, for the purpose of acting with most advantage when those are to be overcome. But it is probable that different animals exert their strengths most advantageously in different directions, and, therefore, practice alone can determine what precise inclination of this line is best adapted to horses, and what to oxen. These considerations are, however, only applicable to cattle drawing immediately at the carriage; and the convenience of this draft, as connected with the insertion of the line of traction, which, continued, ought to pass through the axis of the wheels, introduces another limit to their size.

Springs were, in all likelihood, applied at first to carriages, with no other view than to accommodate travellers. They have since been found to answer several important ends.

They convert all percussion into mere increase of pressure—that is, the collision of two hard bodies is changed by the interposition of one that is elastic, into a mere accession of weight. Thus the carriage is preserved from injury, and the materials of the road are not broken: and, in surmounting obstacles, instead of the whole carriage with its load being lifted over, the springs allow the wheels to rise, while the weights suspended upon them are scarcely moved from their horizontal level. So that, if the whole of the weight could be supported on the springs, and all the other parts supposed to be devoid of inertia, while the springs themselves were very long and extremely flexible, this consequence would clearly follow, however much it may wear the appearance of a paradox,—that such a carriage may be drawn over a road abounding in small obstacles,

without agitation, and without any material addition being made to the moving power or draft. It seems, therefore, probable, that, under certain modifications of form and material, springs may be applied with advantage to the very heaviest wagons; and consequently, if any fiscal regulations exist either in regard to the public revenue or to local taxation, tending to discourage the use of springs, they should forthwith be removed.

Although the smoothness of roads and the application of springs are beneficial to all carriages and to all rates of travelling, yet they are eminently so in cases of swift conveyance, since obstacles, when springs are not interposed, require an additional force to surmount them beyond the regular draft, equal to the weight of the load multiplied by the sine of the angle intercepted on the periphery of the wheel between the points in contact with the ground and with the obstacle, and, therefore, proportionate to the square of its height; and a still further force, many times greater than the former when the velocity is considerable, to overcome the inertia, and this increases with the height of the obstacle, and with the rapidity of the motion, both squared. But, when springs are used, this latter part, by far the most important, almost entirely disappears, and their beneficial effects in obviating the injuries of percussion are proportionate also to the velocities squared.

The advantages consequent to the draft from suspending heavy baggage on the springs, were first generally perceived about 40 years since, on the introduction of mail coaches; then baskets and boots were removed, and their contents were heaped on the top of the carriage. The accidental circumstance, however, of the weight being thus placed at a considerable elevation, gave occasion to a prejudice, the cause of innumerable accidents, and which has not, up to the present time, entirely lost its influence; yet, a moment's consideration must be sufficient to convince any one, that when the body of a carriage is attached to certain given points, no other effect can possibly be produced by raising or by depressing the weights within it, than to create a greater or a less tendency to overturn.

The extensive use of wagons suspended on springs, for conveying heavy articles, introduced within these two or three last years, will form an epoch in the history of internal land communication, not much inferior, perhaps, in importance, to that when mail coaches were first adopted; and the extension of vans, in so short a time, to places the most remote from the metropolis, induces a hope and expectation, that, as roads improve, the means of preserving them will improve also, possibly in an equal degree, so that permanence and consequent cheapness, in addition to facility of conveyance, will be distinguished features of the M'Adam system. [*Quart. Journ.*

On Fertilizing the Blossoms of Pear Trees. By the Rev. George Swaine.

[From the Transactions of the London Horticultural Society.]

An almost general unproductiveness as to the fruit of the superior varieties of pear trees, has long been the subject of complaint with

horticulturists, both of South and of North Britain. Among the first prizes offered by the Caledonian Horticultural Society, was one "for the communication of the best means of bringing into a bearing state, full grown fruit trees, especially some of the finest sorts of French pears, which (it is stated,) though apparently in a very healthy and luxuriant condition, are yet in a state of almost total barrenness;" and the president of the London Horticultural Society, in his paper on the cultivation of the pear tree, remarks, that "the pear tree exercises the patience of the planter during a longer period, before it produces fruit, than any other grafted tree which finds a place in our gardens; and though it is subsequently very long lived, it generally, when trained to a wall, becomes, in a very few years, unproductive of fruit." But I have no need, at least for my own conviction, to refer to the testimony of others for proof of the existing grievance, possessed as I am myself of a striking instance of this untoward disposition in an individual of the genus Pyrus, which has for a long time baffled all my attempts to alter its infertile habits; it is that of a Gansell's Bergamot, which has grown for twenty years or more in its present situation, against a wall, part of which has a south-west, and part a south-east aspect.

This tree has all the appearance of health, and sufficient luxuriance, and has been for several years constantly covered with a profusion of blossoms at the proper season, but has never before this borne more than three or four pears in any one year, and most frequently not a single one. It never occurred to my observation, before the year 1820, when I was much occupied in the artificial impregnation of different kinds of fruits, that, out of from nine or fewer, to fifteen or more florets, of which the cluster (botanically corymbus) of the pear tree consists, only the three lower ones (generally speaking) *set*, or, in other words, are effectually impregnated for fruiting. Recollecting the practice of the best gardeners, of topping their early beans, *i. e.* of pinching off with the fore-finger and thumb, the uppermost blossoms, some apparent, and others in embryo, of the general spike, for the purpose of setting the lower and earliest ones, which would, otherwise, in most cases, prove abortive, I conceived, that removing the upper and central blossoms of the corymbus of the pear, as soon as it could conveniently be done, would have a similar good effect in invigorating the remaining ones, and causing them to set with greater certainty. With this view, in the spring of 1821, as soon as the three lower blossoms of the corymbi began to show their *white* faces, I set to work with my sharp-pointed scissors on two pear trees, the one the Gansell's Bergamot above-mentioned, and the other a Brown Beurré, and in as short time as I could have properly thinned two dozen bunches of grapes, I divested both these trees of at least three-fourths of all their budding honours. On the Beurré, this operation subsequently appeared to have the best effect; for there was scarcely an instance in which the three remaining blossoms did not *set*, which afterwards produced the finest crop of pears I have yet gathered from that tree. But on the intractable Gansell, although the blossoms at first seemed to set, and many of them did

not fall off till midsummer, when they were nearly as large as common gooseberries, yet not a single pear arrived at maturity. By dissecting many of the largest of those which fell off last, and comparing them with some of the Beurrés of the same age and size, it was plain that the kernels of the former had not been impregnated. This circumstance induced me to think that there must be some imperfections in the essential parts of the blossoms.

In the following spring of 1822, on attending to the blossoms of this tree, which blooms earlier than any other pear tree which I have, they appeared to me to remain much longer in a globular state without expanding than any other variety of pear which I have had an opportunity of noticing. I fancied, likewise, that the pointal was fit for impregnation before the anthers were ripe, and even before the petals expanded; and from the peculiarly slender and delicate make of the latter, as it struck me, I supposed that it ceased to be in a proper state as soon as it became exposed to the sun and air; I therefore concluded, that there might possibly be a chance of obtaining fruit, by depriving the blossoms of their petals before they expanded, and inclosing with each floret in this state, within a paper envelope (as is my mode of effecting artificial impregnation,) a riper *blossom*, *viz.* one that had just begun to diffuse its farina, either one of its own, or, preferably, of some other variety of pear. Accordingly, on the 27th of March, 1822, I began this operation, and in a day or two had tied up in the manner just mentioned, twenty-seven blossoms. Ten of these envelopes contained blossoms of the Beurré pear, which (it not blooming so early as the Gansell) were the only ones I could then find in a state of expansion. Fourteen (to make up, with the former number, two dozen) contained blossom from the same tree, and three blossoms of the pound pear. From the latter presenting a large and coarse appearance, I had very little expectation. I intended to have done many more, but the weather getting colder, and being myself not quite in health, I neglected it till it was too late. The papers were not taken off till the 15th of April, on which day the weather began to be warmer, without sunshine. You will please to observe, that I had previously cut off from all the corymbi with which the tree was abundantly furnished in every part, all the blossoms, except the three lower ones, as in the former year; and that having tied up but one of these in each corymbus, I immediately cut off the *two* remaining ones. The blossoms were operated on in different parts and aspects of the tree; for part of it, as I said before, faced the south-east, and part the south-west. Of the *ten* blossoms, treated with the Beurré pear, *eight* set, two of which afterwards fell off, but I suspect not fairly, and six are now proceeding to maturity. *One* only of the *fourteen*, where its own blossoms were used, now remains. Of the *three* wherein the pound pear was concerned, the whole failed. The only pear now on the tree which set naturally, and on which no operation was performed, was produced on a cluster of blossoms, at the extremity of a leading horizontal shoot of last year, which did not make its appearance till after the others had dropped off. This circumstance, by the way,

proves that the fruiting buds of the pear do not invariably require *three* years for their perfection, since the bud, naturally the most productive on the tree in question, could not have been visible, at farthest, before the middle of last summer. As the pears are now from five and a half to seven and a half inches in circumference, I consider them as past all danger of failure, or rather, that they will only fail through the application of violence. Three are in a line within the space of twelve inches near the centre of the tree, and one is on a branch which I considered, at the time of the operation, to be the most unlikely to succeed, as being in the most exposed situation.

Whether the result of the above detailed experiments be such as to authorize an expectation that artificial assistance in vegetable fecundation will hereafter become of so much importance to gardeners in the instances just alluded to, as in those at present recognised, of the cucumber, the melon, the early bean, and the hautbois strawberry, must be left to futurity to ascertain.

Report on the Prize for the Manufacture of Scented Russian Leather. By M. Merimee.

[From the Bulletin de la Société d'Encouragement.]

Gentlemen, considerations, dictated by prudence, determined you to require a year's trial before adjudging the whole prize offered for the manufacture of odorous leather, possessing all the qualities of Russian leather. The time of trial is elapsed, your hopes are realized, new efforts have produced improvements, and France is now in possession of a process which was a desideratum to our industry.

When your committee verified the experiments of Messrs. Grouvelle and Duval-Duval, it was remarked, that particular precautions were necessary in order to be able to impregnate the skins, without staining them, with the empyreumatic oil, which renders them odorous. That oil, as it was then obtained, was fat, and very much coloured. The method of distilling it has since been improved. The oil obtained at present is much thinner, and colours so little, that moroccos of the clearest shade may be strongly impregnated with it without losing any thing of their brightness.

Deceived by experiments which he had not had time to carry far enough, M. Grouvelle had asserted, in the memoir which he drew up, that the aromatic scent of birch-oil does not exclusively proceed from the resin to which M. Chevreul gave the name of *bétuline*. The observations of your committee have induced him to make new experiments, which have led him to find out, that if the epidermis of the birch still affords scented oil after a long digestion in alcohol, it is because the last portion of the resin adheres so to the tissue of the epidermis, and cannot be removed completely. M. Grouvelle,

in a note addressed to your committee, declares, that he is now persuaded that the aromatic odour of birch-oil is produced by betuline, and he has determined the proportions of them approximately.

He has, moreover, at our request, verified an observation which we had made last year, and which explains the difference observed between the leathers newly prepared and those of Russia.

We had thought that we discovered in some Russian leather, bought in England, a mixture of the smell of cedar-wood. In consequence, we distilled some cedar saw-dust, hoping to find, in the product, the same odour that is disengaged when a little of this wood is thrown upon live coals. We were deceived in our expectation; for we obtained only pyrolignous acid and a very thick oil, smelling only of tar. However, a piece of leather impregnated with this oil, lost that disagreeable odour in the air by degrees, and after some months, the aroma of the cedar remained alone, nearly without mixture.

This fact explains why leather prepared recently has not the same smell as Russian leather, which does not reach us till long after it has been manufactured. The birch-oil retains, always, a little pyrolignous acid and tar. Both evaporate in the air, and then the smell of the leather is as pure as it can be.

In Fischerstroem's memoir on the *juchten* or Russian leather, a memoir from which an extract was inserted in the Bulletin for November 1822, it is said that if only the bark of the willow (*saule*) or poplar is employed, instead of oak bark, which has much greater energy, it is because the oak does not grow in high northern latitudes. We have, in many of our forests, oak in abundance; but it grows slowly, and is not found in every part of France. Poplar bark might, therefore, as we have observed, be employed with advantage, and the only effect of such a tannage would be, to give the leather a scent, which would cause it to be preferred: now this quality is not to be disdained, for in Italy the smell of our French leather appears generally insupportable.

With this view, another tree may be mentioned, not very common at present, but which is easily inured to the climate, the tulip-tree. Its bark diffuses a very agreeable spicy odour, and contains a great deal of tannin; therefore there is good ground for believing that leather prepared with the bark of the tulip-tree, would retain a part of the perfume which it exhales.

[TO BE CONTINUED.]

Answer to the inquiry of a Subscriber, in the last number, respecting the best method of raising water from a well fifty feet deep. By S. V. MERRICK, Hydraulic Engineer.

Philadelphia, March 1, 1829.

MR. EDITOR,—A subscriber, in your last number, requires the best mechanical method of raising water from a well fifty feet deep, for domestic and culinary purposes.

The awkward mode of raising water by the counter balance weight, will not answer for so great a depth, and the more laborious wheel and axle ought to be exploded, wherever a pump can be procured: independent of other serious objections to them, the danger incident to an open well, where children frequent, is evinced by the accidents which continually occur.

I know of no method of producing the desired effect, equally simple and advantageous with what is commonly called the sucking pump. The action of this pump depends principally upon the pressure of the atmosphere on the surface of water, by which a column of the fluid is forced into a vacuum formed by raising the upper pump box.

The weight of the whole atmosphere will sustain a column of water 34 feet in height. It would follow, that upon this principle, a pump of greater length than 34 feet would not act; this difficulty vanishes, by giving to the pump rod such a length as shall bring the upper box within the required distance of the surface of the water in the well.

On the principle above alluded to, I have said that the atmosphere will sustain a column of water 34 feet in height, and in theory, a pump, the upper box of which is within that distance of the surface of the water, will operate. In practice, however, it will be found extremely difficult, if not impossible, to create a vacuum sufficiently perfect; and unless that is done, no useful result is to be expected. The nearer the upper box is placed to the water, the more certain will be its operation; and I would not advise, in any case, to exceed twenty or twenty-five feet; as even at this height, the working chamber and piston will require to be very well made. I have always found, in my experience, that the more perfect a machine is made, the cheaper it will eventually prove; although the original cost is enhanced, this expenditure has proved to be good economy.

This remark applies with great force to pumps: if air escapes by the boxes, their operation is seriously affected, if not entirely destroyed. The failure of a house pump may, generally, be attributed to its bad construction; and it is not only a serious inconvenience, but often a greater loss, in the time and labour of carrying water from a distance, than the additional cost of the best instrument, above that of the ordinary log pump. The West India planters find it the best economy to use copper pumps in all cases; the great heat of their climate rendering wood unsafe, from its being apt to split, whilst pump makers are not so numerous as in this country; but for all ordinary purposes, the wooden log, as a tube or conduit, is sufficiently good. For a deep well, the logs should be cut into convenient lengths, taking care that there be a joint about the place intended for the working chamber, say twenty feet from the surface of the water; this may be in the upper end of the lower log; within this insert a lining of brass, or composition, about 16 inches long, and bored out true; this lining should be driven firmly into the wood, which has previously been reamed out the proper size. The lower end of this lining should be bevelled from the inside, to a feather

edge, that no obstruction may remain to prevent the lower box passing through, when it becomes necessary to remove it, after the logs are fixed. In the pump log, below the lining which is there reamed taper, should be placed the lower box or valve, well wrapped with greased hemp, and driven in tight. The hemp packing prevents the passage of air or water round the box.

This box may be made of wood as usual, but as the certain and effective operation of a pump depends entirely on the tightness of its valves, I would recommend that both box and valve be of metal, and without the intervention of leather. The seat of the valve should be a rim of brass, having a groove on the outside to hold the hemp packing, and the inside turned to receive a conical valve made to fit, and both ground together with fine sifted loam till they become water tight. An iron staple ought to be inserted in the rim, that it may be drawn up when necessary.

The upper, or working box, may be constructed in the same manner, and be surrounded with leather, having a similar staple, to which the pump rod is attached.

The ordinary mode of nailing the leather round the wooden box, is very objectionable, and cannot be practised when it is of metal. A method of leathering metal pistons, has been devised, so simple that it may be executed by any worker in wood. It is as follows: take a piece of moderately hard sole leather, cut it into a circular form about three inches larger than the diameter of the pump barrel. To form this leather into the shape required to surround the box, cut a circular hole through a piece of hard plank, a little tapering, the large end of which should be the size of the pump bore, then form a wooden plug, so much smaller than the hole, as to admit two thicknesses of the leather between the plug and the rim, or rather one thickness all round; when thus prepared, wet the leather, lay it over the large end of the hole in the plank, and drive it through with the plug. It is evident the leather must form round the plug, and be so compressed as to take the shape of a cup; if left in the press until dry, it retains its form. This done, cut out the bottom of the cup within the turn, leaving a bevelled edge; wet it and force it on the box. The lower edge may be secured on the box by driving on a brass ring, or by copper wire, which is preferred to iron, from being less liable to corrode. The cost of a pump lining 3¾ inches diameter in the clear, with a pair of brass boxes, with poppet valves, as described, would not exceed 16 dollars. It would outlast numerous sets of pump logs, and the only repairs required would be a renewal of the leather surrounding the piston, every few years. From its not being liable to swell, shrink, or decay, no danger of a failure need be apprehended, and the original extra expense would be amply repaid in a short time, by saving the cost of repairs.

Note by the Editor.—It is our intention to enlarge upon the preceding remarks of Mr. Merrick, by giving some practical rules for the construction of pumps. Where metallic chambers and valves can be procured, there is no question respecting their superiority;

this, however, is not generally the case, whilst there are few places where pumps, with wooden boxes, might not be well made, were the workmen informed respecting the construction of the different parts. To accomplish this end, it will be requisite to present some drawings, which we will have executed for the purpose; they, however, cannot be ready for the next number.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

On the Rotary Steam Engine.

The frequent appearance and disagreement of essays, comparing the respective merits of the rotary and reciprocating steam engine, elicits the following observations.

It is established, and admitted, that there is a law of nature, whereby the intensity of a great force may be compensated by the velocity of a smaller force, or, that a force of 2 lbs. moving one foot, produces an equal mechanical effect with a force of 1 lb. moving two feet.

In other words, that the effect of any given force is, as the space passed through, or described, whether in a right line, or in a curve.

If 2 lbs. be suspended from each end of a balance, or lever, of the first order, equi-distant from the supporting centre, the lever will be balanced, and a pressure of the combined weights, viz. 4 lbs. be on the fulcrum.

If one of the weights (of 2 lbs.) be removed, and a weight of 1 lb. placed at double the distance from the centre, the lever will still be balanced, but a pressure of only 3 lbs. (2 and 1,) will be sustained by the fulcrum. Now there is no reason, *a priori*, why a force of 2 lbs. on one side the centre, should be counterpoised by 1 lb. on the other, because of its greater distance; it is still but 1 lb., and only presses downwards on the fulcrum with a force of 1 lb. The arbitrary term "leverage," will not avail us any thing; it implies merely that the 1 lb. is at a greater distance from the centre than the weight of 2 lbs.

It is then only in reference to *motion* that the 1 lb. is equivalent to 2 lbs.; and if we suppose the 2 lbs. to preponderate for a small, though determinate distance, the greater motion of the 1 lb. would restore the equilibrium, by the law above cited.

We have, therefore, to suppose, that motion can only be generated by the preponderance of the 2 lbs., simultaneously with the compensating property created by such motion, and we then have the two unequal weights balanced, although at rest.

This proposition might, probably, be stated more clearly, and it may add to its elucidation, to say, that the motion generated, and its compensating effects, are cotemporaneous, in the same manner as the balancing qualities of action and re-action.

It is difficult to conceive of cause, (action,) not existing prior to the effect, (re-action,) yet we find that it is so; and this example is perfectly analogous to that of the lever with the unequal weights.

With regard to the ratio, in which velocity will compensate for power, although we see that a double velocity of a given force, produces a double effect, (such is the law) yet there is no violation of pure science, to suppose any other ratio, i. e. there is no mathematical necessity for the law being in this ratio, in preference to any other.

By mathematical necessity, I mean, such as does exist that the diameter of a circle shall always bear the same proportion to the circumference, notwithstanding we have been unable, hitherto, to express that proportion exactly, in any other characters than lines.

Men of science, both practical and theoretical, have evinced more inconsistency in relation to the crank motion, and the rotary engine, than on any other subject, and those, too, who, on the suggestion of a perpetual motion, could scout the idea of a *gain* of power by any arrangement of machinery, or specific application of force—but who will strenuously contend for a *loss* of power, (apart from friction,) in converting the alternating rectilinear motion, into the rotative.

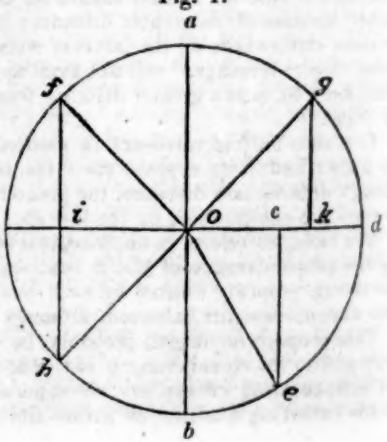
If we would submit our judgments *to*, as we admit the existence *of*, the foregoing law of motion, though it may not always quadrate with our ideas, many mistakes, and much controversy, might be avoided.

Figure 1 consists of a circle, representing the centre of a hollow ring, in which the piston of a rotary engine is supposed to work, and the line *a*, *b*, a cylinder, whose piston has the same area as that of the rotary engine, with a length of stroke equal to the diameter of said hollow ring.

In the time that the piston of the rotary engine shall have made one revolution from *a*, round the circle, to *a* again, the piston of the cylinder will have descended from *a* to *b*, and ascended back to *a*.

Then the distances, described by the two pistons, are, as the circumference of the circle to twice its diameter; consequently, the mechanical effect, and also the consumption of steam, are in the same ratio, or as 3.142 to 2.

Fig. 1.



Now, we may make what calculations we please, and put all the powers of arithmetic and algebra in requisition to our aid, "to this complexion must we come at last."

It may be well to remark, that the centre of percus-

sion, on the piston of the rotary engine, or the circle, which should cut the aunulus, or hollow ring, so that the part of the piston, within and without such dividing circle, should have equal effect, would not be in the centre of the ring, but so far without the centre, as would leave equal contents in the aunulus on each side.

If this were not the case, the effect would not be as we have just asserted, viz. in proportion to the steam used (under equal circumstances.)

The correspondent in the Franklin Journal for December, signed "a hammer," falls into the very popular error, of supposing that when the crank of the reciprocating engine makes an angle of 45° with the force applied, that the mechanical advantage, or leverage, is only one half of the maximum point, or when at right angles.

I must here urge another axiom, that the true length of the lever, is in all cases as the length of a line, produced perpendicularly, from the direction of the force, to the fulcrum, or centre. Therefore, when the crank makes an angle of 30° with the direction of the force, as at *e*, it is at half its power, *c*, *o*, being half *d*, *o*, and if "a hammer" will apply this simple process throughout the quadrantal arc, *d*, *b*, described by the crank, in the time of the piston's descent from *o* to *b*, he will find the deficiency in effect, compared to the rotary engine, as the semidiameter, *o*, *b*, to the arc, *d*, *b*, or as before stated, as 2 to 3.142.

It follows, then, if I am correct in the preceding remarks, that there is no advantage, or gain of power, in theory, by the rotary engine; and we know that there are almost insuperable practical objections. The loss, or rather inferior effect, of the reciprocating engine, is met by a corresponding saving of steam, so that to produce the same power, it is only necessary to enlarge the cylinder so much, that twice its contents shall equal those of the hollow ring.

That there is no loss in the reciprocating engine, by the alternating motion of a heavy weight, connected to the crank, was suggested in a communication in this Journal, of May last, since which, I have received opinions from authority in these matters, that leave no doubt on my mind. One of my correspondents calls the idea of a loss of power from this cause, "an *inadvertency* that only requires pointing out, to be acknowledged."

The best rotary engine I have ever seen, was constructed by Mr. Rutter, of this place, and applied to a small boat. The principle of cutting off the steam, and benefitting by its expansion, was in this engine carried to as great an extent as is usual in reciprocating high pressure engines.

The difficulty of keeping it tight and in order, caused it to be supplanted by an engine of the common kind, using the expansion of the steam in the same degree, without any alteration in the boilers, and the result was, that when burning fuel in the same ratio as with the rotary engine, the boat would run 8 miles an hour, whereas about 7½ miles an hour was the former speed.

It is frequently supposed that when there are two cylinders and cranks connected to the same shaft, at right angles, that equal power

to turn the shaft is exerted at every point in the revolution. An inspection of the figure 1, will make the error of this supposition apparent.

Let *a*, *d*, be the two cranks, at right angles to each other, *a*, on the centre (or dead point) and *d* acting at its greatest power, equal to the length of the lever *d*, *o*, which call 100.

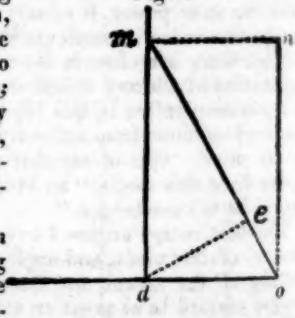
Then, when the cranks are in the relative situations, *f* and *g*, *g* being forced downwards, and *f* upwards, with the leverage of the arms *i* and *k*, each of which levers is as 70 to 100, there is a power exerted to turn the shaft of 140.

If to lessen the greater power at this point, than the first mentioned, we bring the cranks nearer together, we are increasing the power, when the cranks are in the situations *f* and *h*, where we have already a similar power to the last, or 140. And we can approximate no closer to equality, than as 100 to 140.

The use of lines to express the intensity and direction of forces, is well known, and I will here introduce a familiar application of the principle. Let the line *m*, (figure 2,) be the mast of a vessel, of which *d* is the deck, and *m*, *o*, the shroud; draw *m*, *n*, of any length, from the point against which the pressure of the sail is supposed to act, and in the direction of said pressure, as *n*, *m*; draw the line *n*, *o*, perpendicular to *n*, *m*, draw *m*, *o*, in the direction of the shroud, till it touch *n*, *o*. Then we have the triangle *m*, *n*, *o*, each side of which expresses by its length and direction, the intensity and direction of the several forces; *n*, *m*, the sail against the mast, *m*, *o*, the strain on the shroud, and *n*, *o*, the force exerted by the shroud downwards on the mast.

If we turn the figure so as to bring the line *m*, *d*, in a horizontal position, the triangle *d*, *m*, *o*, may represent the half of a framed bridge; draw *m*, *n*, to express any weight on the bridge at *m*; draw the base line *n*, *o*, perpendicularly to the same, and, also, the line *m*, *o*, in the direction of, and which now represents, a brace resting on the abutment at *o*.

Fig. 2.



Then the sides of the triangle *o*, *m*, *n* will represent the three forces forming and balancing the system; *m*, *n*, the weight on the bridge, *m*, *o*, the pressure by the brace, on the abutment, and *d*, *m*, the pressure in the direction *d* to *m*, which is balanced by the opposite half of the bridge; but which, if the figure be considered as representing a crane, would be sustained at *d*.

The difference in intensity of one force to balance another, arising from obliquity in direction, may be resolved into the lever of different lengths, from which the reference to motion as the governing principle is easy. Retaining figure 2 in the position suited to the representing of half a bridge, (and always bearing in mind that the

true length of the lever is a line drawn at right angles from the direction of the force to the centre or fulcrum,) let *m*, *n*, be the weight acting on the lever *m*, *d*, of which *d* is the fulcrum, from which draw *d*, *e*, perpendicular to *m*, *o*, the brace.

Then the weight *m*, *n*, acting on the long lever *m*, *d*, will balance the greater force sustained by the brace *m*, *o*, on the short lever *e*, *d*, *d* being the fulcrum of both, and the weight *m*, *n*, acting on the long lever *n*, *o*, of which *o* is the fulcrum, will balance the greater force *d*, *m*. (which would be opposed by the other half of the bridge,) on the shorter lever *d*, *o*, of which *o* is likewise the fulcrum.

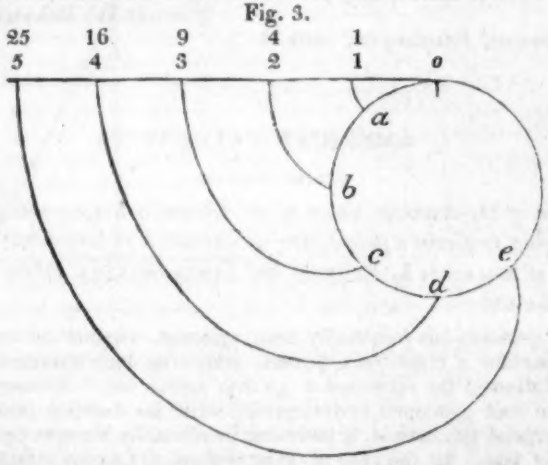
If we now place the figure in its first and erect position, the force of the sail *n*, *m*, against the lever *m*, *d*, is balanced by the greater required force on the shroud *m*, *o*, by the proportionably shorter lever *e*, *d*, *d* being the fulcrum of both. And the force of the sail *n*, *m*, on the lever *n*, *o*, (*o* being the fulcrum) is equal to the greater force downwards on the mast *n*, *o*, and sustained by the proportionably shorter lever *d*, *o*. There is no case in the resolution and composition of forces, in which we use either the triangle or the parallelogram and its diagonal, that may not be explained by the lever of different lengths and its obvious reference to motion.

It was long a disputed point amongst philosophers, and is not yet entirely settled, whether the momentum of matter be as the quantity multiplied into the velocity, in simple ratio, or as the quantity multiplied into the square of the velocity.

One of the arguments growing out of the latter opinion, is, that "a double projectile velocity will balance a quadruple centripetal force."

I introduce this subject, with a view of showing the power of lines to express the central forces.

Fig. 3.



Let the circle, figure 3, represent the orbit of a body revolving round a centre of attraction, and the projectile velocity be such,

that in a given time the body would describe the distance from *o* to 1, were it not for the attracting force acting always at right angles to the projectile, and in consequence of which, the body describes the same distance in the arc *o*, *a*, and is found in the orbit at *a*.

It is evident that as the attraction is ever at right angles to the tangential line of the orbit, the direction of the attraction will vary at every point from *o* to *a*, and can only be represented by a similar curve to 1 *a*.

The order of this curve is called the involute, and may be generated by a thread proceeding from *o* to 1, with a marking point attached at 1, brought down to *a*, the thread being kept tight and closing round and against the circle, and the other curves represented in the figure, are produced in the same manner.

Then, if we imagine the velocity doubled, so that the body would be carried from *o* to 2, in the time it would have been projected only to 1, and the attracting force sufficiently increased to preserve it in the orbit, the body would be found at *b*, but the curve 2 *b* is four times the length of the first curve, (1 *a*,) and expresses an attracting force of four times the intensity. And, although "a quadruple centripetal force is requisite to balance a double projectile velocity," it is only requisite, because the space passed through (or overcome,) is four times as great.

The required attracting force represented by the several curves, is always as the square of the projectile velocity, as by the numbers annexed in the figure. This rule will hold good to any extent, so that the line expressing the projectile velocity might be of such length as to require the thread by which the curve would be drawn to express the attracting force, to wind round the circle any number of times before the marking point should arrive at the orbit.

THOMAS W. BAKEWELL.

Cincinnati, February 20, 1829.

AMERICAN PATENTS.

PATENT CAUSE.

Decision of the Supreme Court of the United States, on the effect of delaying to obtain a patent after an invention is completed; in the case of ABRAHAM L. PENNOCK *and* JAMES SELLERS, *versus* ADAM DIALOGUE.

THE question has frequently been agitated, whether an inventor could sustain a claim to a patent, which he had obtained, after having allowed the invention to go into public use. Although this question had remained undetermined until the decision alluded to in the title of this article, it had been incidentally brought up in our courts of law. In the case of Whittemore, *v.* Cutter, 1 Gallison's Reports, 478, judge Story declares, that, if the original inventor of a machine, &c., suffers it to be freely and fully used by the public at

large, for such a length of time, that this devotion to the public use can be fairly inferred, he cannot afterwards resume the invention, and take out a patent. In the case of Evans *v.* Weiss, (Fessenden on patents, p. 52.) judge Washington is represented to have said, "It must be confessed, that cases of great hardship may occur, if, after a man shall have gone to the expense of erecting a machine, for which the inventor has not then, and never may obtain, a patent, he shall be prevented from using it, by the grant of a subsequent patent, and its relation back to the patentee's prior invention."

"Not only may individuals be injured by a liberal construction of the words of the law, but the public may suffer, if an obstinate or negligent inventor should decline obtaining a patent, and at the same time, keep others at arm's length, so as to prevent them from profiting by the invention, for a length of time, during which the fourteen years *are not running on.*"

In the case of Pettibone *v.* Derringer, tried before judge Washington in 1818, it appears, he did not then consider this question as settled; but he observes, that, "if the patent may relate back to the discovery, however remote, it is obvious that the inventor possesses, to a certain degree, all the rights of a patentee, in addition to those rights which are secured to him by patent. For, in the case of costly machinery, what man would venture to construct and use it, without the permission of the inventor, and without purchasing from him that permission, if the inventor might, at any time afterwards, take out a patent, and forbid the subsequent use of it. Thus the inventor may hold all the world at arm's length, as long as he pleases, and enjoy, to a certain degree, the fruits of his discovery during all that time, and finally secure the right, in its full extent, for fourteen years more, by obtaining a patent."

In the case of Huntingdon *v.* Morris, judge Thompson is of opinion, "That no man should be permitted to lay by for years, and then take out a patent: but that if he was practising his invention, with a view of improving it, and thereby rendering a greater benefit to the public, before taking out a patent, that should not prejudice him." He also observes, "It should always be a question submitted to a jury, what was the intent of the delay of the patent, and whether allowing the invention to be used without a patent, should not be considered an abandonment, or a present of it to the public."

By the kindness of the Reporter of the Supreme Court of the United States, who has placed his MS. report in our hands, we are enabled to present our readers with an abstract of the case, named at the head of this article, and of the opinion thereon delivered by judge Storey.

This case was brought before the court, on a writ of error, to the Circuit Court of the Eastern District of Pennsylvania.

In that court, the plaintiffs had instituted their suit against the defendant, for an infringement of a patent right for "an improvement in the art of making tubes or hose for conveying air, water, and other fluids." The invention claimed by the patentees, was in the mode of rivetting the hose, so that the parts so joined together would

be tight, and as capable of resisting the pressure as any other part of the machine. From the evidence given in the Circuit Court, it appeared, that the invention was completed in 1811, but that the letters patent were not obtained until 1818, and that, in the interval, upwards of *thirteen thousand feet of the hose* were made and sold in the city of Philadelphia, by an individual, who had been instructed in the mode of making, and permitted to sell it, by the inventors. It was not alleged, on the part of the plaintiffs, that, during the period which had elapsed, the manufacture had undergone any important modification, or improvement, but they claimed before the jury, that all the hose, which had been made and sold, had been so, under their permission.

Upon the whole evidence in the case, the Circuit Court charged the jury, "We are clearly of opinion, that if an inventor makes his discovery public, looks on, and permits others freely to use it, without objection, or assertion of claim to the invention, of which the public might take notice; he abandons the inchoate right to the exclusive use of the invention, to which a patent would have entitled him, had it been applied for before such use. And, we think, it makes no difference in the principle, that the article so used, and afterwards patented, was made by a particular individual, who did so, by the private permission of the inventor. As long as an inventor keeps to himself the subject of his discovery, the public cannot be injured; and, even if it be made public, but accompanied by an assertion of the inventor's claim to the discovery, those who should make or use the subject of the invention, would, at least, be put upon their guard. But, if the public, with the knowledge and tacit consent of the inventor, is permitted to use the invention without opposition; it is a fraud upon the public, afterwards, to take out a patent. It is possible, that the inventor may not have intended to give the benefit of his discovery to the public, and may have supposed, that, by giving permission to a particular individual to construct for others the thing patented, he could not be presumed to have done so. But, it is not a question of intention, which is involved in the principle which we have laid down, but of legal inference, resulting from the conduct of the inventor, and affecting the interests of the public."

Upon this charge, the jury gave a verdict for the defendant.

The exceptions taken to this charge, by the plaintiffs, were, in substance,

That, from its nature, the trial of the article was necessarily public; and its abandonment was rebutted, by the article being made and sold exclusively under their permission. That this use of the invention, thus guarded, could not take away their rights, unless after an unreasonable lapse of time, or gross negligence in applying for a patent. That the jury ought to have been instructed, that the making by permission, was an assertion of their claim, and, that the public, by purchasing under this permission, only, acquired no title to the invention.

We do not deem it necessary, to state the points contended for

in the able arguments of Mr. Webster, for the plaintiffs, and of Mr. Sergeant, for the defendant; those interested, will find them in the volume of reports, when published; we proceed, therefore, to our abstract of the opinion of the court.

The whole of the testimony, in the case, given before the Circuit Court of Pennsylvania, was embodied in the bill of exceptions; but this was considered by the Supreme Court, as altogether extraneous, and not properly before them for consideration; the single question being, "whether the charge of the court was correct in point of law." That an inventor may abandon his invention to the public, was considered as an undenied fact, and, that after doing so, he could not, at his pleasure, resume it; gifts once made to the public, becoming absolute, the question, which generally arises, being rather on the fact, than on the law; that is, whether the acts of the party furnish a sufficient proof of abandonment.

The facts stated in the charge of the court, it is observed, are not to be reviewed independently of statutable provisions; the proper exposition of the patent law being necessary to the correct answer to any such inquiry. The constitution gave to Congress, the power "to promote the progress of science, and the useful arts, by securing *for limited times*, to authors and inventors, the exclusive right to their respective writings or discoveries." The limited time was fixed by the act of 21st February, 1793, which also prescribes the terms and conditions, which must be strictly complied with. The thing patented is to be such as was "*not known or used before the application;*" and the patent is granted "*for a term not exceeding fourteen years;*" and gives "the full and exclusive right of *using, and vending to others to be used*, the said invention or discovery," &c. A defendant, charged with having infringed a patent, may plead, "that the thing was not originally discovered by the patentee, *but had been in use*, or, had been described in some public work, *anterior to the supposed discovery by the patentee.*"

These clauses were considered as materially bearing upon the question before the court.

The meaning of the words, "*not known or used before the application,*" cannot be, that the thing was not known or used by the inventor himself, as it is upon his knowledge that he obtains a patent; and, without which, he could not judge of its competency to the end proposed. The words, therefore, must mean, not known or used by others, excepting so far as the employment of others might be necessary to its completion, and excepting, also, the case of piracy. The true meaning, the court concluded, 'was, *not known or used by the public, before the application;* and thus construed, there is much reason for the limitation thus imposed by the act;' with the exception of the limited time, the public have a right to the thing invented. 'If an inventor should be permitted to hold back from the knowledge of the public, the secrets of his invention; if he should, for a long period of years, retain the monopoly, and make and sell his invention publicly, and thus gather the whole profits of it, relying upon his superior skill and knowledge of the structure; and then, and then

only, when the danger of competition should force him to secure the exclusive right, he should be allowed to take out a patent, and thus exclude the public from any further use than what should be derived under it, during his fourteen years, it would materially retard the progress of science and the useful arts, and give a premium to those who should be least prompt to communicate their discoveries.'

The court noticed the similarity of the provisions of the patent law of England, and that of the United States, as respects the requirement, that the thing patented be new; and in the practice, under the English law, cited the case of Wood *v.* Zimmerman, (1 Holt's N. P. rep. 58) where the inventor suffered the thing invented to be sold, and go into public use, for four months before the grant of his patent; and it was held by the court, that on this account the patent was utterly void. Lord chief justice Gibbs said, "The *public* sale of that which is afterwards made the subject of a patent, *though sold by the inventor only*, makes the patent void." It is observed, that, although the words of our statute are not identical with that of England, yet their structure is so similar, as to render it evident, that they were in the contemplation of the framers of it. The hardship which a particular construction of the words may be thought to import, in particular cases, cannot be made the rule of their interpretation. 'If an invention is used by the public, with the consent of the inventor, at the time of his application for a patent, how can the court say, that his case is, nevertheless, such as the act was intended to protect? If such a public use of it, is not a use within the meaning of the statute, what other use is? If it be a case, within the meaning of the statute, how can the court extract the case from its operation, and support a patent, where the suggestions of the patentee are not true, and the conditions, on which, alone, the grant was authorized to be made, do not exist?'

The operation of laws, having similar objects, the policy of bringing inventions into early use, and the fair construction of the words of the statute, were considered as sustaining the opinion given, and manifesting the will of the legislature, a will which the court were bound to obey.

After some remarks upon certain expressions in the sixth section of the act of 1793, which might at first appear to militate against the construction given to other parts of the same act, the opinion concludes as follows:

'It is admitted, that the subject is not wholly free from difficulties, but upon most deliberate consideration, we are all of opinion, that the true construction of the act is, that the first inventor cannot acquire a good title to a patent, if he suffers the thing invented to go into public use, or to be publicly sold for use, before he makes application for a patent. His voluntary act, or acquiescence in the public sale, or use, is an abandonment of his right, or rather creates a disability to comply with the terms and conditions, on which alone the Secretary of State is authorized to grant him a patent.'

'The opinion of the Circuit Court was, therefore, perfectly correct, and the judgment is affirmed, with costs.'

LIST OF AMERICAN PATENTS GRANTED IN DECEMBER, 1828.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the art of manufacturing all articles formed by *Pressing Melted Glass into Moulds;* Deming Jarves, Boston, Massachusetts, December 1.
(See the specification.)

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2. For an improvement in the *Ship Windlass*, for weighing anchors, called "Nicholson's improved Ship Windlass;" Samuel Nicholson, Boston, Massachusetts, December 1.

Patents for several different modifications of, and improvements upon, the windlass and capstan for ships, have, within a few years, been obtained in England; whether either of the plans may be likely to interfere with that of Mr. Nicholson, we shall not at present inquire, but merely give an outline of his plan.

The patentee proposes several different methods of procedure, one of which is represented in the drawing which accompanied his papers, and this he probably considers the best. A cast-iron cog-wheel is fixed upon the end of the windlass. In front of this is fixed another cog-wheel, or pinion, one-third of the diameter, and which geers into the former. One of the gudgeons of this wheel works in the pieces of timber, (bitts,) which support the windlass, and the other in a post, or standard, firmly fixed in the deck for that purpose. A pronged, or forked lever, embraces this smaller wheel, the forked ends being perforated so as to admit, and turn upon its gudgeons. On one side of this wheel, teeth are cut so as to form a ratchet wheel, into which teeth, a ratchet, or catch, attached to the lever, takes; so that when the lever, or handspike, is forced down, it turns the wheel and windlass; the ratchet sliding over in the usual way, as the lever is raised to take a new hold.

An arrangement somewhat similar, is proposed to be applied to a capstan; the levers, of course, working horizontally.

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3. For *Extracting the Gum or Vegetable Matter from unrotted Flax or Hemp*, after its being spun into rope-yarn; Sands Olcott, Harsimus, Bergen county, New Jersey, December 1.

The yarn is to be coiled within tubs, or vats; these are to be filled with water, and the yarn allowed to soak for three or four days; at the end of this time, the water is to be drawn off, and renewed, and this repeated until it passes off perfectly clear. The yarn may then be tarred, or it may have the water wrung out, and be hung up to dry. The process may be hastened by elevating the temperature of the water.

The claim is as follows. "What I claim as new, and my own invention, or discovery, in the above described art, and for the use

of which I ask an exclusive privilege, is, the process of extracting the gum or vegetable matter from unrotted flax or hemp, after its being spun into rope yarn, it being a much quicker and less expensive way of extracting it, than the old way of rotting it in the stalk, or cleansing it in the hurl."

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4. For an improved mode of manufacturing the metallic salts, usually denominated *White Lead*, or Carbonate of Lead; *Carbonate of Copper; Acetate of Copper; and Acetate, or per Acetate of Iron;* Edward Clark, Civil Engineer, New York, December 4.

The patentee is now engaged in testing the principles, and perfecting the process for which he has obtained a patent, and will hereafter supply an article upon the subject, which will be more valuable than the outline which we should otherwise give.

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5. For an improved construction and position of *Water Wheels*, by placing the shaft in an oblique or leaning direction, called the "Inclined Wheel." And also in the mode or method of making a saw-gate to be applied thereto, or to any other moving power; which is called and denominated the "Centre Saw-gate;" Orpheus Thompson, Jericho, Chittenden county, Vermont, December 4.

The shaft of the water wheel is to be inclined so as to form an angle of about 30° with a vertical line. The water is to be shot upon the wheel from a penstock, under an adequate head. It is to strike the periphery of the wheel in a tangential direction, filling the buckets by which it is surrounded, being confined in them by a circular sheathing passing nearly half round the wheel. "The water acts upon the wheel, first by the momentum of its percussive stroke, and then by its gravity upon the inclined plane, having no way to escape until it leaves the wheel on the opposite side."

A vertical or horizontal shaft may receive motion from the oblique, by means of bevel gear.

The saw-gate, as the patentee calls it, is thus formed; there are two levers placed horizontally, with gudgeons in their centres, so as to make their arms equal like those of a scale beam; these are placed one above the other at such distance as is required for the length of a saw. These levers are connected at one end by the saw, working upon pins, and at the other by a screw rod, by which the saw may be tightened, which rod also works upon pins passing through the ends of the lever. A crank, on the end of a horizontal shaft, works a pitman, the upper end of which is attached to the lever.

The patentee "claims as his invention and improvement, the manner of placing the water wheel in its inclined position, and of pitching the water thereon, as the same is herein before described; and also the saw-gate, as the same is made and constructed, and herein before described."

We think that the inventor has proceeded upon the mistaken idea, that power will be gained by the mere lengthening of the levers upon which the water is to act, that is, upon the radii of the wheel. It may be safely put down as a general rule in the construction of water wheels, that where the fall is sufficient to use any other than an undershot wheel, the height of the head ought not to exceed what is necessary for the filling of the buckets of the wheel, and this will rarely exceed one foot. The whole power of the water is derived from its gravity, and could the whole of this be made to act directly upon the wheel, the more would power be economized. This, however, is not the place to write a treatise on water wheels, and upon this subject, therefore, we will only add, that we are at a loss to perceive wherein the improvement in the proposed arrangement consists.

Saws have been hung in a manner analogous to that described. A patent was obtained for an "Armed Saw-frame," by Mr. Samuel Sperry, on the 18th of June, 1828, which bears much resemblance to it. We apprehend that the wear and friction of so many joints, the difficulty of giving stability to the arms, so as to guide the saw correctly, and the curve in which the saw must work, will not only abstract much from the advantages expected, but prevent the "Centre Saw-gate" from becoming a formidable rival to the old fashioned saw-frame.

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6. For an improvement in the *Manufacture of Cloths;* Isaac P. Hazard, and Rowland G. Hazard, Providence, Rhode Island, December 6.

The specification states that this improvement "consists in doubling and twisting two or more threads of cotton together for warp, and weaving wool on. The advantages of this process are, that a larger quantity of cotton can be combined in the cloth, giving it greater strength and durability."

"We claim as our invention, the manufacture of cloth in the manner above described, by doubling and twisting the warp, instead of using the single one, as commonly done."

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7. For an improvement in the construction and arrangement of the *Machinery for making Screws;* Lemuel W. Wright, a citizen of the United States, but now a resident in London, England, December 6.

The specification of this patent is accompanied by six large sheets filled with drawings of the machinery. Whether or not it is similar to that which has been long in use in this country, we are not able to judge, never having had an opportunity of inspecting the latter, which, we believe, was invented by Mr. Daniel Treadwell, of Boston. This manufactory is still carried on in Pennsylvania. In both, the screws are made from iron wire. We cannot attempt any description, but merely present the claims of the patentee.

"Having thus described both generally and particularly the con-

struction and operation of my improved machinery for making screws, I hereby declare that I do not mean or intend to claim separately as my invention, any of the different parts of which these machines are composed, but I do hereby claim the combination, arrangement, and application of them for the said purpose of making screws in the manner herein described, and particularly,

In the combined means which I have employed for feeding the machines with wire.

In the mode of cutting the wire into proper lengths.

In the manner of giving motion to the punches for heading it.

In the methods of conveying the wire shafts from one part of the machine to another, as for instance, from the first heading dies to the second.

In employing two sets of dies for forming the heads.

In the arrangement and mode of turning and finishing the heads.

In the arrangement and construction of the feeding wheel.

In the manner of notching or slitting of the screw heads.

In the arrangement and construction of the revolving holding chops.

In the method of feeding and actuating the same;—and

In the modes of constructing and mounting the dies by which the thread, or worm, is cut upon the screws."

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8. For an improvement in the mode of making *Snatch Blocks;* J. Evans, Charlestown, Massachusetts, December 6.

The specification states that this improvement in the snatch block consists, "1st. In its being opened at the end by a chain, link, and hook, attached to the strap of the block, instead of a clasp, staple, and pin at the side, as in the old plan."

"2nd. A block on this plan, of equal power with the old, need be but half the bulk and weight."

"3d. The old block is constantly liable to get out of order, for frequently, through neglect, the rope is snatched, and a strain brought on, without the clasp being put over the staple, and pinned; and when this is the case, the block most generally splits, and is thrown out of the strap; whereas, on the improved plan, the block cannot be used until the chain link is hooked, which is done with the greatest ease and facility. It is also frequently the case, that after a heavy strain upon the old snatch block, it is difficult to remove the clasp from the staple; but in the new block, as soon as the strain ceases, the chain link is at liberty."

"4th. The improved snatch block may be strapped with either rope or iron, and can, in either case, be repaired without the aid of fire or forge."

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9. For an improvement in the *Corn Sheller;* Thomas J. Dean, Virgil, Courtland county, New York, December 6.

A conical roller placed horizontally, surrounded by rows of iron pins, or teeth, set spirally, and turned by a crank, on one side.

A piece of plank stands on one side of the cone, and is borne against it by springs. The ears of corn are dropped lengthwise between the roller and moveable plank, the former by its revolution removing the grain. Below this roller there is a fan turned by a strap, for blowing off the chaff, and leaving the grain clean. "The principal advantage of this machine over other inventions, is, that in this the corn and the cobs are effectually separated from each other."

Cylinders with teeth are in common use for shelling corn; the first machine made for this purpose, was, in fact, a toothed cylinder; the conical form presents little or no advantage, as the ears of corn taper but little, and except they were always dropped in the right way, the conical roller would manifestly be injurious. The merit of this patent seems to rest upon the use of the fan, which, had it been deemed necessary for the cleansing of Indian corn when shelling, would, from its constant use for smaller grain, present itself to any one as an appendage.

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10. For *Increasing Water Power*, by atmospheric pressure; Samuel L. Holmes, Bedford, Westchester county, New York, December 8.

(See the specification.)

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11. For an improved machine for *Cutting Dye Woods, &c.* called a "Self-feeding Dye Wood and Tan Bark Cutter;" Aaron Foster, Rochester, Monroe county, New York, December 9.

This machine is constructed as follows. There is a vertical shaft, made to revolve by any suitable means; this shaft is contained within a strong frame, the top and bottom of which receive the gudgeons upon which it turns; near the lower end of the shaft, an iron wheel is firmly fixed; the upper side of this wheel is turned perfectly true and flat, and it is perforated with three, four, or more holes, in which knives, or cutters, are fixed like the irons in a plane. This wheel may be two feet in diameter; at about an inch above it is fixed a stationary table or platform, perforated with holes, just above the line of revolution of the cutters. The ends of the logs to be cut, pass through these holes, and are kept in a position nearly vertical, by troughs or gutters of wood or iron, which stand over these holes. The wood is forced down by weights pressing upon its upper end, and capable of being raised by a crank and pulley.

When tan bark is to be cut, these troughs are made about two feet in height above the face of the machine.

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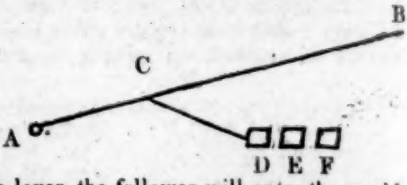
12. For a mode of *Pressing Unburnt Bricks* and tile, by machinery, at one operation, called the "Single Lever Brick Press;" Ephraim Mayo, Hallowell, Kennebeck county, Maine, December 9.

The bed of this machine is a long horizontal frame firmly braced and bolted together; a strong lever, longer than the frame, works

on a fulcrum at one end thereof, the handle part extending beyond the other end, at which the brick is to be pressed. In the accompanying diagram, A, B, is the main lever; at C, a second short lever works upon a joint, and acts upon the follower D. E is the cast-iron mould to contain the brick, and F, the back block. It will be seen that by depressing the lever, the follower will enter the mould, as when the two levers nearly coincide, the power will be very great. There is a counter weight, to sustain or balance that of the lever, and a number of appendages and adjustments which we do not attempt to describe.



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13. For an improved form of *Pump Boxes;* Israel P. Williams and Samuel G. Rea, Salem, Essex county, Massachusetts, December 9.

We are at a loss to discover any novelty in these boxes or valves. If they are not exactly the common puppet valves, they are so much like them, that we think their identity would be sworn to in court. The description given by the patentees is brief, and to us indistinct.

"The box is circular, the valve so constructed as to play with a perpendicular piston, and so graduated in weight as precisely to move without exertion on opening, and fully to prevent loss of water when shut. The box, clapper, or valve, the cross bars, the piston, and, indeed, the whole article is, or may be, composed of the same material; the construction, therefore, from the causes stated, added to which is the fact that neither nails, leather, or other material is used, render the same superior to any heretofore used. The model accompanying, will, we hope, fully explain our wishes."

"And be it further known, that our intention is the application thereof to the use of shipping, and to all other than steam engines, or where hot water is applied."

The material of which the boxes are to be made, is not stated, but in another communication, wood, cast-iron, or composition, are named. Why these valves, when made of metal, are not to be used in steam engines, or where hot water is applied, we know not, particularly as the builders of steam engines have, heretofore, *ab urbe condita*, been in the habit of employing them. The model and drawings exhibit their construction as follows: there is a circular box, or seat, turned conical; into this fits a conical valve, having a tail passing through a hole in a cross bar, to guide it up and down. A staple, or bow, is attached to the valve seat, rising above it, as in the common pump box, for the purpose of removing and replacing it.

Query. Is not this the common conical, or puppet valve?

14. For *Cutting and Preparing Meat for Sausages,* and for stuffing them; Samuel Fahrney, Washington county, Maryland, December 9.

These machines we think very ingenious, and are preparing drawings for the engraver, in order to illustrate them fully.

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15. For sawing and cutting *Felloes for Wheels* of carriages, and other circular work; Samuel Fahrney, Dec. 9.

Several patents have been taken out for machines to saw felloes for wheels. In some of them, two saws are employed, placed at a distance apart equal to the width of the felloe; these are intended to give the proper curvature to the inside and outside of the rim; in general, however, one saw only is used, allowing the imperfection in the curvature to be corrected by dressing. In all of them the plank to be cut is fixed upon the end of an arm, working upon a pin at the opposite end, and capable of adjustment in its length, according to the radius of the wheel; these saws usually work vertically, and the feeding is effected in different ways. In Mr. Fahrney's machine, the saw, with its frame, works horizontally, and the piece to be cut is affixed to an arm which is raised vertically; there is a rag-wheel and feeding hand, in principle like those of the common saw mill. A pinion upon the shaft of the rag-wheel, raises a rack, which pushes against the under side of the arm, bearing the plank to be cut.

Its main features strongly resemble those of several other machines in the office, and we are not aware that the difference in its form includes any superiority in its action.

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16. For a *Washing Machine,* for washing clothes; Eber Blodget, Watervleit, Albany county, New York, December 10.

This machine is a rectangular trough, or box, to contain water. Across the bottom of the trough, are rollers placed near to each other, and nearly touching the bottom. Above this is placed a fluted wash-board, from the centre of which rises a pin or standard, passing into a lever working on a pin on one side of the box, and pushed backward and forward by its opposite extremity; between the rollers and the wash-board, the clothes are to be placed.

"What I claim as new, and as my invention or discovery in the above described machine, and for the use of which I ask an exclusive privilege, is, the manner in which I use the lever power or motion, in operating the two articles, *viz.* the wash-board, and bed of rollers together, so as to wash clothes with ease and facility, without the least injury to the finest cloth," &c.

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17. For an improvement in *Locomotive Engines* or carriages, propelled by steam, on rail, or other roads; William Howard, Esq. United States Civil Engineer, Baltimore, Maryland, December 10.

The engravings are in preparation to publish this patent with three copper plates. They will be ready at an early day.

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18. For an improvement in the *Repairing of Fences;* Edward Pitkin, East Hartford, Hartford county, Connecticut, December 13.

There may be something novel in the subjoined plan of splicing posts, the bottoms of which have rotted off. We, however, have frequently seen the posts both of rail and board fences, spliced at the bottom in a manner so similar to that described and figured in the drawing in the office, that we are unable to tell the difference between the old and the patent mode. That our readers may discover it, we insert the following, which is the whole of the specification.

"This improvement consists in backing or splicing the posts when the bottoms are rotted off. A quarter of a round butt of any tree that is suitable for posts, and about seven feet long, is sawed in a slanting direction, half way across, about 2½ feet from one end, and on the opposite side, the same distance from the other end, and then split apart from one sawing to the other, making two backing pieces with a but to stand in the ground. In case such timber is used as will not split, it may be sawed or hewed into a square shape of about six inches diameter, and sawed diagonally, from about two feet of one end, to about two feet of the other end."

"To repair a post when rotted off at the bottom, the post is raised up and kept in its place, at the height wanted—the backing piece set into the ground so as that the shoulder will be a little out of the ground, and then fastened to the back of the post, by two or more spikes (cut ones preferred.)"

"When a five holed post is rotted off, so as to destroy the bottom hole, the centre of the post may be cut up to the next hole, and a backing piece cut off and slanted so as to fit in, the end coming up so as to form a bottom to the fourth hole, and a spike driven through the sound part of the post on each side, making in this way a four holed post. Posts to fences of all descriptions may be repaired in this way."

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19. For an improved mode of *Propelling Boats* on canals or elsewhere, by steam or other power; Nathaniel Bingham and Pliny Warner, Rochester, Monroe county, New York, December 15.

This is an apparatus for propelling boats by setting poles, working on the bottom of a canal, or other water. The mode proposed, is as follows. Upon the deck of the boat, about midship, or nearer the bows, a beam reaching across from gunwale to gunwale, works upon a pin, or bolt, passing through its centre. A reciprocating motion is given to the "traverse beam," from the piston rod of a steam engine, working horizontally; or from any other motive power.

This traverse beam is connected at each end to sliding pieces which pass along each gunwale to the stern of the boat, and to the ends of these slides, setting poles are attached, which pass down to the bottom of the canal. By giving motion to the traverse beam, these setting poles are alternately brought into action. It is proposed sometimes to have two setting poles on each side. In this case, there will be two sliding pieces along each gunwale, with a pinion between them, working into a rack on each. The effect of this arrangement is apparent. The patentees say: "what we claim as new, and as our invention or discovery, and for which we ask the exclusive privilege, is the peculiar mode of working setting poles by means of the sliding pieces and traverse beam (or by rack and pinions) thus located and arranged, and put in motion by any common machinery now known or used."

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20. For certain *Nostrums for the cure of Gout*, Rheumatism, Dropsy, &c. &c.; Elisha Smith, New York, December 15.

Mr. Smith tells us that he has "invented a sirop, tincture, and external applications, for the cure of gout, rheumatism, *siphilis*, dropsies, and all kinds of ulcers, and all impurities of the blood." But as we have adopted a general rule, which forbids our publishing recipes, or compositions of matter, which are patented, we must leave those unfortunate invalids to their fate, who are labouring under all, or any of the diseases named, or refer them to the "nostrums" of Mr. Smith, namely, his sirop, tincture, and external applications.

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21. For an improvement in the art, or manufacture, or *Construction, of Fences of Iron*, or other metal; Paulus Hedl, New York. Issued, Feb. 21st, 1822. Re-issued, December 18, 1828.

In this specification it is stated that "the improvement in this art for which the said Paulus Hedl claims a patent, consists in the attachment by any convenient means, of a cast-iron ornament, of brass, or composition, or iron, or other metal, to the upper end of wrought iron balusters, sometimes called bannisters, poles, or bars, used in iron, or metallic fences of all kinds." Cast-iron ornaments, it is stated, have been attached to cast-iron posts and columns, but the patentee limits his claim to the attachment of cast ornaments to wrought iron balusters.

We have, certainly, seen vases and other ornaments of cast-iron and of brass, attached to wrought iron fences, in numerous instances, yet this, if we understand the claim of the patentee, is his discovery. Do not the cast brass knobs, and other ornaments of that metal, which have been so long in use, on hand, and other rails, interfere with the claim of this patent, or do we entirely misunderstand it?

For the circumstances under which a patent may be re-issued, see the next article after this list.

22. For a new mode of using the *Hinged Water Wheel;* Matthew D. Brown, Mason county, Virginia, December 19. (See specification.)

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23. For a machine for *Rolling Leather;* Harvey Paign Alexander, Genesee county, New York, December 23.

This machine bears a strong resemblance to some which have been used for rolling pasteboard, and book-binders' boards. A frame is made to swing backwards and forwards upon gudgeons, by which it is hung to two side posts; near the lower end of this frame, there is a "roller of cast-iron, seven inches long, and five inches in diameter, with gudgeons at each end," working in two iron plates. Under this roller, is a piece of timber worked out to the segment of a curve, serving as a bed for the roller. The gudgeons of the frame have some vertical play, to allow for inequalities in the thickness of the leather. A box is attached to the lower part of the frame, to be loaded with weights to any required amount. The leather is placed upon the curved part of the bed, and the frame caused to vibrate by means of a pole attached to the box by a staple. The patentee says,

"The leather is placed on the bench under the roller for the purpose of rolling it. The lathe is moved by the pole attached to the box, by hand, so that the roller moves on the leather to be operated upon, the length of the circle on the bench, compressing the leather in its operation, and making it firm and smooth with great despatch and ease, the labour and time being much less than when performed by hand."

"This inventor claims as his invention, *the utility of the machine,* and particularly the contracting the weights to the centre under the roller, which makes the roller run smooth and equal upon the leather. He also claims as his invention, every part of the machine in every particular, except the roller. The roller has been made and used before the discovery of the subscriber. The other part of the machine has not been known or invented before, to the best of his knowledge or belief."

This invention, or discovery, appears to us to be just such a one as would have been made by any carpenter who had been requested to make a machine for the purpose. We doubt very much the superiority of the box and weight, to the spring pole, which has been frequently used in similar operations. A machine fixed like that for glazing calicoes, with a roller instead of a flint, would, we apprehend, fulfil all the required intentions, without interfering with the broad claim of the patentee, to "every part of the machine in every particular, except the roller."

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24. For a machine for *Cleaning Smut, White Caps, and other impurities from Wheat* and other grain, called the "Vertical Wheel Rubber;" Townsend Carpenter, Elmira, Tioga county, New York, December 24.

A vertical wheel of wood, about 22 inches in diameter, is made to revolve on a shaft by means of a crank. Sixteen pieces of sheet iron cut narrow at one end, and wide at the other, are nailed upon one face of the wheel, so as to radiate from its centre, and reach its periphery, a space being left between each of the pieces equal to about one half their own width. These pieces of iron are punched in the manner of a grater, the rough sides being outward. A stationary plank, similarly covered, stands opposite to the face of the wheel. The grain to be cleaned, is contained in a hopper above, and as the wheel revolves, is rubbed between the two faces, passing out below, where it may be winnowed by a fan wheel placed there for that purpose. There are many parts which we have not attempted to describe, such as a casing for the wheel, regulating screws, &c. but enough has been said to give a general idea of its structure.

Wheat cleaners with cylinders of sheet iron, punched with small holes with the burs outwards, have been constructed, and, we believe, largely used. The general principle of their action is the same with that described, although greatly differing in form.

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25. For an improved *Washing Machine;* Samuel A. Brownson, Montrose, Susquehanna county, Pennsylvania, Dec. 26.

A trough, or box, the ends of which are semicircular, is suspended so as to vibrate upon pins, or gudgeons. The circular part, or bottom, of the interior, has rounds placed near to each other, and passing from end to end of the box; a square hole is left in the cover, to admit the clothes. Two upright posts receive the gudgeons, and sustain the machine. A vertical lever is fastened by a pin, to the lower end of one of the posts, and projects up above the end of the trough. A pin, fastened to a standard on the end of the trough, passes through a mortise, or slot, in the lever, and a vibratory motion is given to the machine by the operation of the hand on the lever. The patentee says, "what I claim as my invention, is, the form of the interior, as specified, and the motion given by the vertical lever."

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26. For an improved method of *Planing, Tongueing, Grooving,* and cutting into mouldings, on either plank, boards, or any other material, and for reducing the same to an equal width and thickness; and also for dressing brick, and cutting mouldings on, or facing metallic, mineral, or other substances; William Woodworth, Hudson, New York, December 27.

The machine for which this patent was obtained, is in actual operation, and executes good work. We have seen a piece of cross grained white pine plank, which had been planed, tongued, and grooved, by it, with a finish which it would have been difficult to have given with the ordinary fore and match planes. It differs essentially from all the planing machines which we have heretofore known. The knives, or cutters, for planing, are arranged so as to form a

cylinder or drum, being attached by their ends to two circular plates. These cylinders are made to revolve with a very rapid motion, the plank, or board, being carried forward by a rack and pinion. Whilst the face is thus planed, a tongue and groove may be cut upon the edges by wheels with cutters projecting from them; the plank is by this process brought to an exact and equal thickness. Circular saws are used to bring the plank to an equal width, or to cut it into strips. Cutters for mouldings, work on the same principle. "Said William Woodworth does not claim the invention of circular saws, or cutter wheels, knowing they have long been in use; but he claims as his invention, the improvement and application of cutter or planing wheels, to planing boards, plank, timber, or other material; also his improved method of cutters for grooving, and tongueing, and cutting mouldings in wood, stone, metal, or other material; and also for facing and dressing brick, as all the wheels may be used single, or separately, for moulding, or any other purpose before indicated. He also claims as his improved method, the application of circular saws, for reducing floor plank and other materials, to a width."

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27. For a process by which the greatest quantity of *Spiritous Liquor, or Whiskey, can be extracted from Indian Corn;* James R. Nance, Floyd county, Indiana, December 27.

This being a recipe, we do not publish it without the approbation of the patentee.

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28. For a mode of *Polishing, Graining, or Dicing, Morocco,* or other leather; and polishing and glazing pasteboard, or other paper, and other fabrics, by machinery, at one operation; Abel Bayrd, South Reading, Mass. December 29.

The patentee refers in his specification, to a machine for a similar purpose, patented by Jacob Perkins, in the year one thousand eight hundred and nine, of which machine he uses certain parts, but in others substitutes improvements of his own, for which the present patent is obtained. A horizontal shaft, revolving between two uprights, carries four, or any other number of arms; on the ends of these arms are affixed the graining, dicing, or polishing balls, or rollers, or blocks, of box, or other material. These are adjusted by screws and slides, and pressed forward by a spiral spring, wound round a cylindrical rod on the arms. A curved table stands under these arms, and upon this is placed the leather to be grained. A brush is affixed to a cross beam, into which the upright posts are mortised; these clean the balls, rollers, or blocks, in every revolution of the arms.

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29. For an improvement in the inflections of the common *Scythe Sneath,* and in the *nibs,* or knobs, and in the mode of *spoting;* Silas Lawson, Sterling, Massachusetts, December 29.

This patent is taken for the particular inflection of the sneath, or

handle, which the patentee prefers, and which he describes and figures. To us it appears perfectly similar to many which we have seen in use; we, however, cannot pretend to judge on so delicate a subject as the proper flexure, and tortuosity, of the ligneous appendage to a scythe. The improvement in the nibs consists in having the sneath well seasoned, and fitting them without wedges. The other improvements we shall not at present attempt to describe, as we should give to this article greater length than it appears to us to demand.

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30. For a mode of preparing *Grooves for Mule Drums*, of tin, copper, or iron, at one operation; John Butterworth, Philadelphia, December 30.

A die, and a forcer, each of cast-iron, eighteen inches long, are formed with fillets and grooves to fit into each other; the strips of tin, or other sheet metal, are pressed between them so as to be raised into the intended shape. These strips are afterwards bent round and soldered on to the drums. The patentee says,

"I claim no more than the dies and forcers as my new and useful improvement. I also claim the application of the said grooves to the tops of card, and drawing pans for machinery, and which I call grooved hoops, or bands."

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31. For an apparatus to *Supersede the use of the Crank* in machinery, called "the Compound Zigzag Screw;" Joseph Woodhull, Rochester, Monroe county, New York, December 31.

The apparatus consists of a cylinder, to which a rotary motion is to be given. A groove is made around this cylinder, or a fillet is formed on it, to which a zigzag, or curved form, may be given. This groove, or fillet, is made to give the desired motion to a lever, or rod, instead of communicating it by a crank. This is what is claimed, and is viewed as "obviating the loss of power in the crank motion, produced by the dead points."

We apprehend that the loss of power by the friction of the grooves or fillets, will far transcend that from the *dead points* of the crank. The latter, indeed, we think in general, is a mere bugbear, as in the greater number of cases where its faults have been attempted to be obviated, it is the best of all possible applications.

In the third volume of the Repertory of Arts, old series, there is a patent, dated 1788, for working pumps, rubbing boards, &c. by means of a cylinder and its appurtenances, (a groove and pin.)

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32. For an improved machine for the purpose of *Locking Wagons;* John Davidson, Brownsville, Fayette county, Pennsylvania, December 31.

This is a friction bar, moved by a rack and pinion, the rack being placed under the centre of the wagon, and made fast either to the coupling pole, or the bed of the wagon: from the pinion an iron

rod projects along to the side of the wagon, and on this there is a crank with which to apply the necessary power.

The description is very general, and affords but an imperfect idea of the plan adopted. Nothing particular is claimed.

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33. For a *Ring Groove Spinner;* John Thorp, Providence, Rhode Island, December 31.

This gentleman has recently obtained several patents for improvements in spinning; we mean to embody, and publish them at a future day.

Information to Patentees,

On the surrendering of a Patent for the purpose of amending the Specification, by the Editor.

It is the practice of the patent office, under a decision to that effect, to admit of the surrender of a patent, by the patentee, should he discover that, through inadvertence, he had not described his invention, or discovery, in those clear and exact terms which the law requires. It is to be understood, however, that the new specification must not include any improvement not intended to have been included in the former; it must only describe it more exactly, and make known more explicitly what the patentee claims as new. The patent of Paulus Hedl, No. 21, in the foregoing list, was thus surrendered. The new patent bears the same date with the former, and the legal fee, thirty dollars, must be paid. The justice of this procedure is manifest, and we think it a great hardship that the practice under the patent law, does not admit of the same justice, when any defect in the claim is discovered in court; in this case, if the patentee enumerates half a dozen points upon which he rests his claim to invention, and one of these is found to be old, the patent is vacated, and the whole is lost to him, whatever may be the real extent of his merits. Had he made the discovery before the validity of his claims had been questioned in court, he might have corrected the procedure, by surrendering his patent; but when the same is discovered by a litigious adversary, and his acute counsel, he has no remedy.

When a patent is surrendered, for the purpose of having it re-issued, it ought to be accompanied by a deed of surrender, to be recorded in the patent office. The subjoined is a good form.

To all persons to whom these presents come, greeting. Whereas, through inadvertence and without any design, the specification of my improvement in [*the machinery for cutting and heading nails at one operation,*] annexed to, and making part of, certain letters patent, issued to me therefor, and bearing date the — day of ——, A. D. ——, and hereunto annexed, is defective; and whereas, in conformity with approved precedent, I am entitled to surrender the said patent, and obtain another for the same improvement, in more full, clear, and exact terms: Now therefore, know ye, that I, A. B., the paten-

tee named in the annexed patent, have surrendered, and do hereby surrender to the government and people of the United States of America, the right and liberty in said patent, to me granted or intended to be granted; and do herewith re-deliver the same to the Secretary of State of the United States, to be cancelled, annulled, and made void.

In testimony whereof, I, the said A. B., have hereunto set my hand and seal, this — day of ——, A. D. ——.

A. B. [L. S.]

In presence of us.
——C. D.
——E. F.

Account of a patent for Manufacturing Glass Knobs for Doors, Drawers, &c., by making them at one operation, without the aid of blowing. Granted to HENRY WHITNEY, *and* ENOCH ROBINSON, *of Cambridge, Massachusetts, Nov. 4th,* 1826.

THE object of making public the claims of a patentee, may frequently be better attained by methodizing and abridging, than by publishing the whole specification. We have given many examples of this, in our exemplified monthly list, and we shall frequently do so with patents of older date.

The improvement in making knobs, consists in pressing them in moulds, which moulds are made in three parts: two of these parts, which form the lower part of the knob, are hinged together, like the ordinary bottle mould, with handles to close and open them, and a clasp to keep them together when closed; this mould reaches as high as the widest part of the knob, and forms the whole of it, excepting the face. This lower mould is left open at top, and is to receive the melted glass from which the knob is to be formed. There is a cylindrical rim, from one-eighth to half an inch in height, projecting or rising above that part of the lower mould which is to give form to the knob. This is for the purpose of receiving and guiding the top part of the mould, which forms the face of the knob.

The top part just fits into this projecting rim, and is cut so as to impress any pattern or device, which may be desired. From the centre of its face proceeds a steel pin, either round or square, and of sufficient length to pass entirely through the knob. The bottom mould has a perforation through the centre, about the size of the pin; this is a receptacle for the surplus glass, which the pin displaces.

When the mould is used, it is placed on a table prepared to receive it. On this table there is a perpendicular standard, with projecting arms, in order to support a lever, and serve as guides to the shank of the upper mould. This part may be called the press.

A rod, or shank, is affixed to the centre of the back part of the upper mould. This rod passes through two guide holes in the arms of the press, which keep it in a vertical position. Upon the end of

this rod, the lever acts in giving an impression on the knob. These arms are made to swivel round, in order to remove the upper mould out of the way, whilst the melted glass is put into the lower; there being a check, to keep it in its proper place, when brought back for use.

By means of a spiral, or other, spring, the lever may be sustained, when not forced down by the hand.

The knob, when taken out of the mould, is "so entirely finished, that it only requires fire polishing, to make it a neat article, fit for immediate use."

The patentees say, "we do not claim to be the original inventors of the mould, as applied to the formation of glass wares, but admit, that for many purposes, it has been heretofore used. Our invention consists in this:—a new combination of the various parts of the mould, with the use of the pin and machinery before described, in such a manner, as without any blowing, to produce a finished knob, with a hole perforated through it, and a nick, or enlargement, so that it will not come out of the mould without opening it, at one operation, by compression merely."

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for a Hinged Water Wheel, granted to MATTHEW D. BROWN, *Mason County, Virginia, Dec.* 19, 1828.

THE improvement on the hinged water wheel, is as follows, viz: There are in the first place, sixteen arms inserted into a shaft of the description long since in use, consisting of eight sides, (two arms on each side,) at the usual distance from each end: to every two arms is affixed, by hinges, (or staples used as hinges,) a float or bucket, the breadth of which corresponds with the diameters of the wheel, so as to act freely between the range of arms on each side; one-fourth of each bucket to be beyond, and three-fourths within the hinges, next the shaft when closed; each bucket is bevelled on the outer as well as the inner edge; midway between the extreme arms, are inserted into the shaft, other arms, one on each side, to support the buckets; to each of the arms last mentioned a staple is affixed, for the purpose of fastening the buckets by a hook affixed to each. If deemed necessary, other intermediate arms may be inserted into the shaft, but one set, eight in number, is considered sufficient.

The wheel thus constructed, is susceptible of being used either horizontally or perpendicularly, with or without a dam.

When used horizontally, at a stage of water above the centre of the shaft, the floats are loosened from the arms, and the water is confined in its operation upon the buckets or floats, by being planked over the current in such a way, that the lower edge may be about two-thirds as high as the wheel, and so near to it, as barely to let it have a free and unobstructed revolution; the said planked way rises

with a slope of forty degrees up stream; and a covering of plank is to extend from the top of the former, over the wheel, horizontally.

The advantage of water power, in this position, is considerable, inasmuch as the water is confined to the wheel by the planked covering; and in each revolution, strikes the floats twice; first pressing them (as the wheel revolves,) to the arms, and secondly, throwing them out four degrees beyond a square; and if the water is so high as entirely to cover the wheel, it yet operates in the same way; the water forming an eddy in the upper portion of the wheel, above that part under the first operation of the current. When the water is not above the centre of the wheel, the buckets are to be fastened to their respective intermediate arms. The floats may be rendered strong, by affixing a cross plank or bar to the inner side of each, where it comes in contact with the arms. If the wheel be vertical or perpendicular, two-thirds of its diameter is to be exposed to the current, and one-third to be within the abutment. In this position, also, the water strikes each float twice in each revolution of the wheel, in a manner similar to the former.

The parts, for the improvement of which a patent is now asked, are, the fastening of the buckets to the intermediate arms in time of low water, (when not above the centre of the shaft.)

2ndly. The fastening of the buckets by hinges, at one-fourth from the outer edge.

3d. The buckets opening four degrees past the square, and being twice operated upon in every revolution.

4th. The planking, so as to apply the power of the water to the wheel with greater force.

The wheel improved as aforesaid, is contemplated to propel any machinery whatever, to which water power may be applied.

MATTHEW D. BROWN.

Specification of a patent for a mode of Increasing Water Power by Atmospheric Pressure. Granted to SAMUEL L. HOLMES, *Bedford, West Chester county, New York, December* 8, 1828.

THE mode of increasing water power by atmospheric pressure, is specified and described in the following words, to wit:

Construct a horizontal flue, three feet high by six wide, which is to be introduced at one end, into a dam of only equal height, and sustaining at the opposite end a perpendicular flue, six feet by one foot, raised to any height under thirty feet, and having an opening at bottom into the lower flue, of at least double the dimensions of the throat, for the passage of water upward, with a sliding gate affixed, enclosing the bottom of the upright flue, in order to fill it with water, through a small opening or hole at the top of said perpendicular flue, thus excluding the air.

When both the horizontal and perpendicular flues are filled with water, the hole at the top of the last mentioned flue is secured, the

sliding gate at bottom removed, and the whole is ready for immediate and continued operation.

This application of atmospheric pressure, in the increase of water power for machinery or mechanical purposes, in the mode above described, I claim as my own exclusive invention, and for which, letters patent are here petitioned.

SAMUEL L. HOLMES.

Remarks by the Editor, and by the Patentee.—It is the practice of the superintendent of the patent office, not only to give information to applicants for patents, respecting the operation of the law, and the usage of the office, but also, to remark freely on the correctness of the principles, the utility, or novelty, of the invention upon which the claim to a patent is founded. In conformity with this practice, a letter was written to Mr. Holmes; the purport of this will be manifest from his reply, a portion of which is subjoined. Although we are fully of opinion, that the patentee will find he has been mistaken in his assumptions, yet he writes with so much intelligence, as to prove that his errors are those of a gentleman of excellent understanding, and his opinions are therefore entitled to respect. Instead of giving our own views upon the subject, he shall be heard on his own behalf. We should not presume to publish any extracts from his letter, were we not convinced that our course in so doing, would meet with his entire approbation.

Extracts of a letter from Mr. SAMUEL L. HOLMES.

"It was not, my dear sir, until after a course of careful and repeated experiments, that my own mind admitted the practicability and usefulness of increasing water power by atmospheric pressure. In attempts of this kind, our wishes, I know, are apt to bias our conclusions; and the partialities we entertain for our own ideas or projections, expose us, not a little, to unconscious error and just animadversion. But, in the progress of my investigations on this subject, every objection that presented itself was candidly weighed; for it was evident, if this use of atmospheric pressure could produce no diminution of ordinary labour in effecting the same object; if, after the column were once raised, by filling the perpendicular flue, the pressure of the atmosphere without, would not sustain the column of water within; if the same column, in its discharge, would not continue to be supplied by the same cause; and if the quantity of that discharge would not be in proportion to the height of that column, this application of the principle would, of course, be altogether futile: but if, by atmospheric pressure alone, unaided by any operative machinery, or by any manual labour, except in the mere filling of the perpendicular flue in the first instance, all these points could be gained, then, the feasibility and importance of the object proposed could no longer be doubted. Thus have I thought, and thus reasoned; and the result of my experiments has been, a sincere convic-

tion of having attained my end, and of having taken nothing for granted, but what fact justified, and science established."

"This statement is due to you, sir, and it is equally due to myself, in vindication of the step taken, in troubling your department for a patent."

"I would now beg leave, and your friendly letter evidently invites me, to enter a little more into detail, on this subject. In the course of some instruction, which, as principal of the academy in this place, I was, several months since, giving to a pupil, on the construction and use of the barometer, the inquiry was suggested to my own mind, whether the fluid, thus sustained by the outward pressure of the air, could be made to discharge underneath the same column, and be applied, with the weight of its own perpendicular pressure superadded to that of the same fluid, on whose surface the upright column was raised; and whether, as this column discharged, it would continue to be supplied, by the same sustaining cause."

"My first experiment was made with what I have called a horizontal and a perpendicular flue; the former open, the latter closed, except at the bottom, on one side of which an opening was likewise left, below the surface of the water in the lower flue, for the free admission of water into the upper flue. The perpendicular flue, filled with water to exclude the air, and thus introduced into the horizontal flue, also filled with water, was erected directly over a closed orifice or throat, at one end of the last mentioned flue. On opening this throat, the water was found to discharge freely, without admitting air into the upright flue; the elevated column continued to be sustained, and the requisite supply to be readily furnished, by the pressure of the atmosphere alone. Several other experiments were made, unimportant in their results; but doubts were still to be removed. It was true, the water discharged, without interruption, at any point below its natural level; the column was faithfully sustained, and the supply furnished; but, did the discharge proceed in part from the elevated column, or was it produced only by the water in the horizontal flue, while the water in the column above it continued not only to be supported, but to be retained there, by atmospheric pressure? To ascertain this point, I had a perpendicular flue constructed, with a partition in the middle, at the bottom, extending above the surface of the water in the lower flue, so as to cut off all connexion between this flue and the throat. The result was precisely the same. The water discharged with the same freedom; the column was still sustained, and the supply afforded as readily as before. One doubt, however, yet remained. Did this column discharge, in force and quantity proportional to its height? This last doubt was satisfactorily removed, by repeatedly ascertaining, that, within a given time, a much greater quantity would be discharged, through the same orifice, *with* the column, than *without* it. Now, in regard to water, quantity, if properly applied, is power. If, then, by atmospheric pressure, a far greater quantity of water, within a given time, can be similarly applied, where a less quantity only could be otherwise employed, water power may be most essentially

increased, without labour, by the simple application of this principle alone."

"This, sir, is my honest conviction; but, though it be the result of cautious and persevering research, yet, it will not justify me in saying, I may not be in error, so long as the decision of your better judgment stands against me."

Specification of a patent for an improvement in the art of manufacturing all articles formed by Pressing Melted Glass into Moulds. Granted to DEMING JARVES, *Boston, Massachusetts, December* 1*st*, 1828.

To make articles of pressed glass, by the method in which they now are, and heretofore have been manufactured, a mould, giving the *shape* and ornamental impressions, has been required for *each* article manufactured; and the shape of the article or vessel intended to be made, is preserved during the cooling of the metal, in a receiver of like shape as the mould, and thus the manufacturer is obliged to possess and use, a *mould* and *receiver* for *each* article, of different size and shape, which he makes.

The improvement for which I ask an exclusive privilege, consists in pressing all the glass, intended for the various articles and vessels to be manufactured, into sheets by a mould, which impresses upon the sheet of glass, all the ornamental figures intended for the article or vessel to be made. I thus obtain, by the use of *one* mould, sheets of ornamented glass, and out of these sheets the article to be manufactured, as to *size*, shape, and figure, is to be produced by receivers of the size, shape, and figure required. The sheets of glass, (being impressed as aforesaid,) are placed upon the receiver, in so heated a condition, as to sink or settle into the receiver, and thus acquire its particular form and figure; and, should these sheets become too cool to settle readily into all the slopes and angles, and take the true shape and figure of the receiver, a *follower* of same shape with the receiver, is used to force the metal into all the parts of the receiver. Any excess of glass is removed, or cut, from the edges of the receiver in the usual manner.

DEMING JARVES.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Observations on the Measure of Impact.

OF the various modes of applying power in mechanical operations, there is, perhaps, none so simple nor so much in use, as that of impact, or percussion; and yet, there is probably none, the measure of which is so little understood.

Either of the *mechanical powers*, technically so called, may be so applied, as to produce and maintain any intensity of pressure through any length of time, without the least expenditure of force: hence they are each susceptible of comparison with the power of a dead weight at rest. And it appears, that philosophers and mathematicians had, for a long time, puzzled themselves with fruitless attempts to institute a similar comparison, in relation to the force of impact. But as impact necessarily implies an absolute development and expenditure of mechanical force, and a weight at rest expends no force, the idea of comparing them was at length found to be an absurdity. This discovery, however, so far as I have been able to ascertain, has not been followed by the substitution of any other standard of comparison, by which to estimate the power in question.

Having recently had particular occasion for such an estimate, I was compelled, *ex necessitate*, to attempt a solution of the difficulty myself. The result is so simple as to make me doubt its novelty—but, whether new or old, I presume that to many of the readers of the Journal of the Institute, it may prove serviceable.

It is known that the momentum, acquired by a heavy body or weight, in falling through a given distance, constitutes a power precisely equivalent to the raising of the same weight through the same distance, or to the raising of any weight through any distance, provided the product of the weight and distance be, in each case, the same. For the terms *raising a weight*, may be substituted the terms *overcoming a resistance*. Connect with this, the consideration of the distance through which the resistance is overcome; and, though it may make more rhymes than we like, it may furnish us with a fit subject of comparison, with the force of impact. In most of the processes in which this force is employed, the intensity of the resistance varies, in some instances regularly, and in others irregularly, while yielding to the blow—but, to embrace an estimate of the effect of such variations, would render our calculations more extensive and complex, than the present purpose of illustration requires. In the following examples, therefore, the resistance is assumed to be uniform.

Example I.—If a pile driver of 500lbs. weight, with a fall of 20 feet, sinks the pile 1 foot, what was the resistance?

As 1 foot : 500 lbs. : : 20 feet : the answer 10,000 lbs.

Example II.—If a weight of 100,000 lbs. is found just sufficient to overcome the resistance to the sinking of a pile, what weight, falling 20 feet, will sink the pile 9 inches?

As 20 feet : 100,000 lbs. : : 9 inches : the answer 3750 lbs.

Example III.—From what height must a weight of 1200 lbs. fall, to drive a pile 3 inches against a resistance of 150,000 lbs.?

As 1200 lbs. : 3 inches : : 150,000 lbs. : to the answer 31¼ feet.

In piercing metallic plates by means of a punch and die, there is a still more astonishing exhibition of the immense resistance which is overcome by impact, through minute distances.

Example IV.—If a weight of 100 lbs. falls 10 feet, what resistance is it capable of overcoming through a distance of $\frac{1}{10}$th of an inch—that is, the thickness of the plate?

As $\frac{1}{10}$ inch : 100 lbs. : : 10 feet : the answer 120,000 lbs.

But if the metallic sheet to be pierced is $\frac{1}{100}$ part of an inch thick; then a weight of 100 lbs. falling 10 feet, would be capable of driving before it through that minute distance, a resistance of more than *one thousand tons.*

To calculate the force usually applied by the hammer, mallet, &c. used by hand, would require a more precise estimate of their velocity than I can at present furnish. This should be ascertained by experiment; and the result, I doubt not, would astonish the most experienced workman.

CARLOS.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of a Condenser and Refrigerator, intended as a substitute for a Worm in Distilleries, the Cooler in Breweries, and the Condenser in Steam Engines; By BENJAMIN F. JOSLIN, M. D., *Professor of Mathematics and Natural Philosophy, in Union College, Schenectady, N. Y.*

THIS apparatus *consists essentially of two contiguous laminated and convoluted cavities*, through one of which the refrigerant fluid circulates, and through the other, the calorific, in the *opposite* direction, communicating its heat to the former, through the medium of a thin lamina of metal. The usual method of constructing it, is to unite by hard solder, several sheets of copper, so as to form one long rectangular sheet. This is folded in the middle, and the two equal and similar halves rolled up together, commencing at their line of junction. They are, either previously or subsequently, separated by the interposition of slips of lead, to the distance of from one-sixth to one-half of an inch, according to the intended magnitude or use of the apparatus. With this lead, together with the solder, some, or all, of the four spiral edges of the two laminated spaces, as well as their outer extremities, are closed. When, for facilitating inspection, purification, or repairs, the spiral opening is left unclosed, at either the upper or lower end of the apparatus, it is temporarily closed by a flat plate. In forming these cavities, the interior and exterior extremities of each, are dilated into a cylindrical form, for the reception of four pipes, to give admission and exit to the calorific and refrigerant fluids. The above apparatus unites, in a higher degree than any hitherto employed for similar purposes, the properties of *simplicity*, *cheapness*, *compactness*, and *refrigerant power*. One of them, which occupies but the space of a cubic foot, condenses and cools a gallon of spirits per minute. No tub is required for its immersion. With an ample supply of water, the effect would be much greater than that above stated; for owing to the thinness of the passages, their correspondence in form and direction, and the great number of convolutions of which they are susceptible in a given space,

any requisite velocity may be given to the refrigerant liquid, without disturbing the regular progression of those opposite series of temperature, which exist in the adjacent coils, or permitting the particles of the two fluids to escape mutual influence; an advantage which, for obvious reasons, it is impossible to realize with the common worm.

The inventor of the above described apparatus, obtained his first *patent* for the essential parts of the same in 1824; Yandal's refrigerator, remotely allied to it in principle, was patented in Great Britain in 1826 and 7; and though considered a valuable invention, it omits some of the most important features, and possesses only *one-third* of the refrigerating power of the American apparatus, as can be easily demonstrated. A bare inspection of the drawings of both will show, that only one out of the three laminæ of the former is employed in transferring caloric, whilst in the latter, the *whole* metallic *surface* may be rendered effective. Moreover, the two fluid laminæ being subjected to each other's influence, on both sides instead of one, the effect will be equal with a double width of the channels, and with an equal width, greater from this cause alone, than in the European apparatus. The access which may, (from the facility of applying a cover,) be afforded to the interior, and which is done in the latter modifications by the inventor, also gives it a great advantage for some purposes, as in the manufacture of beer; where a glutinous substance adheres to the inner surface, which, in this apparatus may be effectually removed, by the introduction of an instrument resembling a spatula or a small spade, covered with some elastic substance. As a refrigerator for worts, this occupies about the one five hundredth part as much space in the building, as the ordinary cooler; and in warm weather especially, reduces the worts to a lower temperature, and in a shorter time, and always *without* the *least exposure* to *atmospheric air.*

Do not theory and experience concur in showing, that the worts are frequently injured by the atmospheric oxygen, so extensively applied in the ordinary mode of cooling?

It would be easy to point out numerous useful applications of this invention; as the heating of mash in distilleries, salt water in the manufacture of muriate of soda, water for steam boilers, and air for various purposes.

The aggregate, as well as internal form of the apparatus, the arrangement of its passages, and the relatively small extent of its external, compared with its internal surface, give it an unparalleled power of insulating the temperature of its contents, with little loss, by conduction and radiation. This property not only increases its value in its application to some of the useful arts, but also renders it an important instrument, for many experimental researches on caloric, and especially for determining the specific heat of liquids, vapours and gasses. Perhaps this may be the subject of some future communication.

Remarks by the Editor.—We were particularly pleased with the principle of Yandal's apparatus for cooling worts and other fluids,

which was the subject of a patent in England, and was published in this Journal, vol. 4. p. 184. We were not then aware that the merit of the original invention belonged to our own country, and, was the property of Professor Joslin. Yandal's patent was sealed August 24th, 1826, and enrolled February, 1827. The foregoing article, referring back to the records of the United States' Patent Office, to the year 1824, plainly puts this question at rest.

A second patent, for a very similar apparatus, was obtained in England, by Robert Wheeler, a Brewer; his patent was sealed in November, 1827, and enrolled in May, 1828. The patentee calls it "*Archimedes' Condenser or Refrigerator;* the peculiar novelty of which, consists in forming the chambers for the passage of the fluids in spiral channels, winding round a central tube, through which spiral channels the hot and cold fluids are to be passed in opposite directions."

This, like Yandal's, it is proposed to use as a condenser for stills, and for other purposes. It appears, indeed, to be the same thing, varied in form only, and, although it might possibly be sustained as different, according to the practice under the English law, we are convinced, that with us they would be considered as identical. Our concern, however, does not relate to this point, but to the fact, that the invention is American; and, although it is very possible that it may have been invented in England also, it is much more probable that it was taken either from New York, or from the United States' Patent Office, as has been the case with *many* other inventions, which have been patented in England.

We have seen many certificates of the value of Professor Joslin's apparatus; from these we give some extracts, as they may serve to make a valuable invention more extensively known.

"Joslin's patent Condenser succeeds well, and I believe it to be a very useful invention.

WILLIAM THOMPSON, Superintendent of a distillery.
Lenox, Madison county, New York, Sept. 8th, 1826."

"Manlius, September 14th, 1826.—The Condenser put up in my distillery by Dr. Benjamin F. Joslin, is yet in successful operation; and the longer I use it, the more perfectly I am convinced of the great importance of the invention. ORLANDO SMITH."

Under date of September 19th, 1826, HENRY POLHEMUS, of Auburn, states, that the Condenser "makes twenty degrees difference in the temperature of the spirits."

Several others of subsequent date might be given, but as they are to the same effect, we add the following only, from a brewer.

"New York, April 12th, 1828.—Having one of Professor Joslin's refrigerators in operation in my brewery, in this city, I am satisfied that it is a very valuable invention for cooling Worts, and far superior to any other with which I am acquainted.

HENRY BUNCE."

Reply to two Queries in the last number of the Journal of the Franklin Institute, respecting the comparative effect and value of different falls of Water.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—In No. 2, Vol. 3, of your Journal, a subscriber propounds the following queries, viz.

1st. How many inches of water under 15 feet fall will produce the same effect as 100 inches under a 20 feet fall, both acting on overshot wheels under a 3 feet head?

2nd. Suppose 100 inches of water of 20 feet 6 inches fall, be received at 600 dollars per annum, what will be the value of 100 inches, the fall being 9 feet 8 inches, the situation being otherwise equal?

To which it is believed the following observations are applicable.

The power of water, to produce mechanical effect, is as its perpendicular fall, the true measure of which is found by multiplying its weight by its fall; but the best devised modes of applying it will not produce equal effects in equal portions of its fall. For example, take the circumstances of query 1st, the fall 20 feet, acting under 3 feet head, which for convenience I shall divide into 3 feet head and 17 feet fall.

It has been found that the greatest effect, in relation to the power of water acting by gravity on a wheel, is as 8 is to 10, and that the head, or that portion of the descent from the surface of the water in the reservoir to the point where it impinges on the wheel, is as 1 is to 7. (See Smeaton's Experimental Inquiry, pages 31 and 32.) By applying these data to the circumstances of query 1st, we have the following calculations and results.

Suppose 100 tons of water to descend from the reservoir to the top of the wheel 36 inches × 100 = 3600 power, the effect will be as 1 to 7,	= 514.28
Descent on the wheel 17 feet = 204 inches × 100 = 20400 power, the effect will be as 8 to 10,	= 16320.
Effect of 100 tons of water under 20 feet fall,	16834.28

To find the effect under 15 feet fall, divided into 3 feet head and 12 feet fall.

Head 36 inches × 100 = 3600 power, the effect is as 1 to 7,	= 514.28
Fall, 144 inches × 100 = 14400 power, the effect as 8 to 10,	= 11520.
Effects of 100 tons under 15 feet fall,	12034.28

Effect. *Inches.*

As 16834.28 : 100 : : 12034.28 : 139.9 inches, answer to query 1st.

Query 2nd. The annual value of 9 feet 8 inches fall, compared with 20 feet 6 inches fall, will depend in some measure on the method of

its application. The results of three different modifications are exhibited in the annexed calculations.

1st, 20 feet 6 inches head and fall to be applied to an overshot wheel under 3 feet head.

Suppose 100 tons of water to descend from the reservoir to the top of the wheel, 36 inches × 100 = 3600 power, the effect as 1 to 7, = 514.28

Descent on the wheel 210 inches × 100 = 21000, effect as 8 to 10, = 16800.

Effect of 20 feet 6 inches fall, 17314.28

9 feet 8 inches fall, to be applied to an overshot wheel under 3 feet head.

Head 36 inches × 100 = 3600 power, the effect as 1 to 7, = 514.28

Fall, 80 inches × 100 = 8000 power, the effect as 8 to 10, = 6400.

Effect of 9 feet 8 inches fall, on an overshot wheel, 6914.28

2nd. If 9 feet 8 inches fall be applied to a wheel 14 feet diameter under 3 feet head, that is, with the gate 4 inches below its horizontal centre, it is believed that the best method of applying the water, is, to direct it in a tangent to that point of the wheel where the bucket shall receive it, which will be (if the opening shall be 2 inches wide,) about 18 inches below the gate; the impinging point will then be at the bottom of the bucket, 14 inches below, (if that be the depth of the bucket.) Thus arranged, the head and fall will be,

From the top of the water to the gate,	36 inches.	
From the gate to the receiving point,	18	
From the receiving to the impinging point,	14	
		68 head.
From the impinging point to bottom of wheel,		48 fall.
Head and fall,		116

Effect of the head relative to the power in this last arrangement will be as 1 is to 6.

Suppose 100 tons of water descend to the impinging point 68 inches × 100 = 6800, the effect as 1 to 6 = 1133.33

Descent on the wheel 48 inches × 100 = 4800, the effect as 8 to 10 = 3840.

4973.33

3d. The same as 2nd, with centre buckets in place of close buckets, 14 inches deep. In this case the impinging point will be 18 inches below the gate.

Head and fall thus: to the gate,	36 inches.	
From the gate to the impinging point,	18	
		54 head.
From the last point to the bottom of the wheel,		62 fall.

100 tons × 54 = 5400 power, the effect as 1 to 6 = 900
100 tons × 63 = 6200 power, the effect as 8 to 10 = 4960

Effect of 9 feet 8 inches fall on breast wheel with centre buckets, 5860
As 17314.28 : 600 dollars : : 6914.28 : $233.83, value of 9 feet 8 inches fall, overshot.
As 17314.28 : 600 dollars : : 4973.33 : $172.35, value of breast, buckets 14 inches deep.
As 17314.28 : 600 dollars : : 5860 : $203.7, value of centre buckets.

The depth of the shrouding is always lost from the fall on overshot wheels, and as the loss is greater in proportion on small than on large wheels, (unless the shrouding be narrower in proportion as the wheel is smaller,) the 6 feet 8 inch wheel will fall something short of the result assigned to it in the calculation. ANOTHER SUBSCRIBER.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Remarks on Arnott's Elements of Physics. By a Correspondent.

THE "Elements of Physics, or Natural Philosophy, General and Medical," lately republished by Messrs. Carey, Lea & Carey, under the editorship of Dr. Hays, is a treatise well fitted to serve the purposes of those who have not leisure to peruse works constructed on the plan of rigorous demonstration. To many readers, a knowledge of leading facts and general principles, is more interesting than purely scientific discussions. Conversation, even in mixed assemblies, often turns on these great outlines of science. For the purposes of general society, therefore, their acquisition must be rendered as easy as possible. At the same time, then, that we should deprecate the substitution of vague, discursive *reading*, for diligent *study*, in the physico-mathematical sciences, among the classes of our various seminaries, we ought to rejoice at every effort which makes those sciences accessible and available to the mass of mankind. To this end are directed the establishment of public lectures, the publication of popular treatises, the institution of practical schools, and the circulation of journals for the dissemination of useful knowledge.

The medical profession of our country will be under particular obligations for the republication of this interesting volume. The word *physician*, as generally applied, has often proved a curious misnomer, in being appropriated to those who have no knowledge of "physics;" *luceas a non lucendo*, and *doctor* a non docendo, or *a non docto*.

Dr. Arnott's division of his work, is, on the whole, judicious; his facts and illustrations well selected; his explanations simple and intelligible, and his style lucid and familiar.

His *method* of presenting the several subjects, might, perhaps, be improved by placing his general statements on what he calls the "analyses," at the *end*, instead of the *beginning* of his sections, and

the separate propositions as *results*, not as *foundations* of his facts, experiments, and particular illustrations.

It seems strange to suppose that the student will understand an analysis, or abstract expression, before he has in mind any of the facts on which it is grounded; yet such is the perversity of the antiquated method of instruction, from which the author has not been able wholly to free himself. The American editor has partly obviated this objection, by adding to each of the first two sections, an appendix, containing all the important general truths which have been exhibited in the course of the section; and in one or two instances has departed so far from the professed design of Arnott in excluding "technical mathematics," as to introduce the *abstract* or *algebraical*, as well as the general expressions of the principles under discussion. This appears to be the true course of instruction, and if the work arrive at a second edition, it is to be hoped the same course will be pursued with respect to all parts of the book.

Dr. Hays has, likewise, added a few notes, particularly relating to the *medical* department of the subject, which will be found useful to men of that profession. J.

Franklin Institute.

Extract from the Report of the Committee appointed by the Board of Managers of the Franklin Institute, to view Mr. Isaac Macauley's *Floor Cloth Manufactory.*

The committee state that they were appointed by the preceding Board, at the instance of Mr. Macauley, to view his establishment at Bush Hill, in consequence of attempts having been made to influence public opinion unfavourably towards his manufactory, by drawing unfair comparisons between it and the foreign fabric.

"One of the leading objects of this institution, has been that of introducing the consumer to the producer; and while they would decline any interference between rival manufactures of our own country, the Board deem it entirely within the spirit of their duty, to allay, if possible, any prejudice that may exist against our own products, where the foreign comes in competition, and wherever the former is worthy of protection. Under these views the committee was appointed with instructions to wait on that gentleman, which they have done.

"Mr. Macauley afforded them an opportunity of viewing his extensive and interesting Manufactory throughout, and observing the operations in all their details. They, therefore, have no hesitation in risking their reputations for judgment in this article, by giving their opinion, that the oil cloths of all descriptions made by him, were equal to any they have ever seen, and presented great evidence of the improvement made in this manufactory, since it has been in Mr. Macauley's hands.

"The large floor cloths, which the committee first examined, are made from flax or hemp, and wove in pieces of 21 feet wide, and 60 feet long, (making 140 square-yards in each piece, without seam.) When finished, they are suspended the above size, in a drying house, an edifice admirably contrived for the purpose, where they gradually harden, until they are fit for use, which, we were informed, required at least twelve months. Of this, the committee could have no doubt, as they found from 14 to 15,000 yards, finished in a handsome style, most of which have been there more than a year. On examination, they were found to be strong, very hard, well filled with paint and varnish of the best quality, and exhibited no tendency to peel off, or stick. The patterns are well selected, to imitate Brussels and other carpeting, colours rich and bright.

"In the fabrication of lighter cloths, for covering tables, &c. Mr. M. has been eminently successful. In the large quantity of 15 or 20,000 yds. suspended in various parts of the premises, the committee saw none which would not do credit to any maker. They were well made and elastic. The fabric is of cotton, covered with gum elastic, and other varnishes, (for which improvement, Mr. Macauley has obtained a patent,) without any of the crumbling mixture so often found in German cloths. The surfaces were smooth, and beautifully figured and bordered, in all widths from 2-3ds to 6-4ths.

"We understand, that by the introduction of labour saving machinery, he is enabled to reduce the prices of his cloth, and at the same time, maintain its reputation for good quality, offering them for sale at a reduction of 10 to 12½ per cent.

James Ronaldson, Chairman.

"*Philadelphia, February 10th*, 1829."

Proposals for a series of Experiments on the effect of water on wheels of different kinds, to be undertaken by the Franklin Institute.

To Correspondents.

At a meeting of the board of managers of the Franklin Institute of the State of Pennsylvania for the promotion of the mechanic arts, held March 12, 1829, the following resolutions were proposed and adopted, viz.

Whereas, the value of water, as a moving power, and the relative effects produced by it upon wheels of different constructions, have never been fixed by actual experiments, on a scale of sufficient magnitude to settle the principles upon which it is to be calculated; and whereas, a course of experiments of sufficient magnitude, to fix the data from which such calculations may be made with accuracy, would be of great value to every one interested in mill work; therefore,

Resolved, that it is expedient for the Franklin Institute to undertake a series of experiments, for the purposes set forth in the above preamble, provided sufficient funds can be obtained for the purpose.

Resolved, that a committee of inquiry be appointed, with instructions to apply to the select and common councils of Philadelphia,

for the use of part of the city water works, and water from the dam at Fair Mount, for the purpose of prosecuting such experiments.

Resolved, that said committee be authorized to solicit funds from such as may be interested in these experiments, to aid in carrying them into effect:—Whereupon, Messrs. S. V. Merrick, Benjamin Reeves, Isaiah Lukens, Rufus Tyler, and Andrew Young, were appointed on said committee. Extract from the minutes.

WILLIAM HAMILTON, Actuary.

By the annexed preamble and resolutions, it will be seen, that the Franklin Institute have it in contemplation to conduct a course of experiments on the value of water power, and a comparison between the different constructions of the water wheel, with a view of establishing principles sufficiently accurate for the basis of the millwright's calculations. So soon as the necessary preliminary steps are taken, and the funds are obtained, (the estimated expense to be obtained by subscription is $2000,) a commission will be appointed of gentlemen conversant with the subject.

The want of such a course of experiments has long been felt, and the great expense attending them, has debarred individuals from making the attempt. The funds of the Institute are not adequate to it from their usual resources, and they are reluctantly compelled to call upon those interested for assistance, which they are confident will not be withheld. Through the liberality of the city councils, they are enabled to conduct them in a situation highly favourable, the Fair Mount water works, under an 8 feet head and fall, where the water expended and effect produced, can be accurately estimated.

To enable the committee to enter upon the discharge of their duties under every advantage, correspondents are requested to furnish the editor of this Journal with such information as their ingenuity or practice may suggest, and which may aid them in deciding on the best manner of conducting the experiments.

The experience of practical men on the best mode of applying water to a wheel, form of buckets, manner of ascertaining its effects, with proper diagrams, will be particularly acceptable.

A report of all the experiments made by the committee, with their results, will be published in this Journal, when completed; and the Institute is desirous that the grounds of their proceeding may be as public as their report, to enable practical men to detect any defects in operation. Communications may be sent by mail to the editor; donations of those who feel disposed to aid the Institution in their exertions, to the actuary, or either of the undersigned.

SAMUEL V. MERRICK,
BENJAMIN REEVES,
ISAIAH LUKENS,
RUFUS TYLER,
ANDREW YOUNG,
} Committee of Inquiry.

Protection against Damp, Rust, &c. *By* John Murray, F. S. A., F. L. S., &c.

I find that if linen or woollen cloth be immersed in water, saturated with *quick-lime and sulphate of soda*, and then carefully dried, delicate steel instruments folded up in it, even if themselves damp, are effectually preserved from rust or oxidation. The rust of iron is found to contain a carbonate of that metal, and the aqueous particles of "wet," and "damp," are, it is proved, decomposed by the contact of iron at all temperatures, and with increased effect at an elevated one; hence, the formation of rust, or oxidation, &c. It is probable that the caustic lime not merely absorbs any minute quantity of carbonic acid present in the air, and by damp brought into more immediate contact with the iron or steel, but also absorbs the first portions of present damp; perhaps, too, caustic lime may even take up *oxygen*.

The effiorescent sulphate of soda does not attract humidity, but rather casts it off, parting even with its own water of crystallization.

It is evident that an envelope of cotton or woollen cloth, saturated as described, would not only be a protection against damp in the case of steel, plate, &c., but also of equal value for the preservation of deeds, &c., whether on paper or parchment.

Steel articles, &c. may be very well preserved, if buried in powdered quick-lime.

From a number of experiments I have made by suspending, by means of a silk, &c. thread, finely polished and magnetized steel bars in *lime water*, so as to float freely in this medium, from the point of suspension, I have concluded that it points out an admirable method by which the magnetic virtue may be preserved for an indefinite period. A ring of iron, inclining to the "angle of no attraction," pointed out in Mr. Barlow's Researches, might surround the phial or little glass globe, and the cardinal points be engraved by a diamond on a circular line, externally. Under these circumstances, poised in a uniform medium of unvarying density, no atmospheric mutations would disturb it, and the finely polished steel needle would be preserved even free from oxidation, the fatal antagonist to magnetism.

On the relative quantity of Steam condensed in vessels with bright metallic and blackened surfaces. *By* R. W. Fox, Esq. Vice President of the Royal Geological Society of Cornwall.

Two cubical vessels of tin plate, of which the surface of one was bright, and that of the other covered with lamp-black, were connected with a steam boiler, by tubes so inclined towards the latter, as to allow all water resulting from condensation in the tubes, to return to it. The vessels were of equal dimensions, four inches side, and

the experiment was made in a close room, of which the temperature was 82°; that of the steam being at a mean of 215°. The water was withdrawn by cocks properly adjusted for the purpose; and at the expiration of seventy-two minutes, the bright vessel had afforded 5.7, and the blackened one 10.2 cubic inches. Now, supposing steam of this temperature to be 1600 times rarer than water, in 24 hours the condensation from one foot of blackened surface would be 489,600 cubic inches, or 1736 gallons of steam, and from an equal extent of bright metallic surface 273,600 cubic inches, or 972 gallons. Hence, the condensing energies of a blackened and polished metallic surface were to one another as 1736 is to 972. When the difference between the temperature of the heated body and that of the surrounding medium is greater, the effect will be proportionally augmented.

But when currents obtain, it is probable that the effect will be increased in both; but that the ratio of this increase will be greater for the bright, than for the blackened surface.

[*Brewster's Journal.*

Polytechnic Society of Frankfort.

The Polytechnic Society of Frankfort on the Maine, for the promotion of the useful arts, and the sciences connected with them, was instituted in 1816. It is composed of members taken from every class of citizens, particularly amongst artizans. Mutual instruction in mechanics, the useful arts, and the sciences connected with those arts, forms the principal object of the Society. In order not to interrupt the weekly labours of the workmen, a Sunday class has been established purposely for them since 1818, which is in the most prosperous condition. The committee of management of this institution, have added to the plan, a saving bank for its members, and an annual exhibition of the produce of industry and the arts. The funds of the saving bank in question, amounted in the first five years to nearly half a million florins, proceeding from 2,500 deposits. The annual exhibitions have also been successful.

Dr. Granville's Travels.

LIST OF FRENCH PATENTS

Granted in the first quarter of the year 1828.

Sequin, letter press printer, Paris, for manufacturing china pasteboards—5 years.

Claude Pierre Roux, jeweller and gilder, Paris, for a mechanical frame, called a *pendule*—5 years.

Pierre Jeandeau, Knight of the Legion of Honour, Director of the Works of the Royal School of Arts and Trades, at Châlons, for

a machine for throwing up a continued steam, suited for draining—10 years.

John Nicholson, Paris, engineer, for a process, apparatus, and machinery for preparing and printing the threads of flax, cotton, silk, &c.—15 years.

Claude Jean Baptiste Alexander Berthault, Surveyor of Roads, Châlons, for a process for making a water-proof cement—15 years.

Victor Lemétayer, manufacturer, Fécamp, for a warping machine—10 years.

Pierre Bouillon, junior, Limoges, for a system of steam engines of all pressures—10 years.

Auguste de Boussard, clock-maker, Toulouse, for a superior self-cleansing level lamp—10 years.

Francois Chatelard and Petrus Perrin, steel comb makers, Lyons, for a comb of a new form, adapted to broad cloths—5 years.

Delamnay, surgeon, Nantes, for an instrument of a particular form for midwifery—5 years.

Jacques Nicholas Legendre, Ecquainville, for a mechanical mode of making barrels, tubs, &c.—15 years.

Jean Pierre Praget, Ais, brazier, for a still—10 years.

William Kinner Marshal, London, for a new method of mounting cannon—10 years.

Hemsteller and Rieger Bommer, Vassellonne, for a new method of making roads—10 years.

Jacques Javel, junior, one of the Proprietors of the *Messageries Royales*, Paris, for the construction of a carriage for transporting goods and passengers with expedition—15 years.

Louis Aubry, merchant, Chaumont, for a machine for sowing by back-stitch and quilting, called the *Métier Régulateur*—5 years.

Dumont, refiner, Paris, for a method of baking, clarifying, and filtering sugar—10 years.

Alexander Derlin, Paris, for the application of hydrogen gas to lamps with a double current of air, serving as an impellant and burner—15 years.

Daniel Girand, Paris, for a method of using the "*filvire*," invented by Caiman Duverger—5 years.

Paul Portal & Co., Bordeaux, merchants, for a steam engine with Gurney's high pressure—15 years.

Bertrand Fourmond, engineer, Nantes, for a printing press, with jointed movements, by means of a lever, called the *Presse Nantaise*—5 years.

Dr. Barrier, Lavoulte, for a pneumatic hydraulic machine—15 years.

Michel Oddo, mechanician, Marseilles, for a method of preventing smoky chimneys—5 years.

Joseph Guyon, Dole, for the construction of an economical kitchen furnace—10 years.

Pierre Agathe Mostier and Jean Baptiste Bourgen, mechanics, St. Etienne, for a process of making wide ribands on looms *a la Zusichoise*—5 years.

Henri-Joseph Pohlen, Paris, for a method of taking the gloss off cloths and other stuffs—5 years.

Jean Pierre Palissard, Escornebœuf, for a machine called a *Tractariaterre*, for transporting earth—5 years.

Bruno de Villeneuve and Jean Jacques Mathieu, silk manufacturers, Lyons, for a method of making watered ribands, called *a grands effets*—10 years.

Sequin & Co. civil engineers and manufacturers, Annonay, for a steam boiler, on the principle of the warm air circulating in small isolated tubes—10 years.

Edward Dodd, pianoforte-maker, for certain improvements—5 years.

William Newton, London, for metallic blinds and window shutters—5 years.

Jacques Francois Adam, Paris, for a new method of binding books—10 years.

Jean Fayolle and Jean Baptiste Joseph Legros, brace makers, Paris, for a loom with four pedals for manufacturing several garters or braces at once—5 years.

Antoine Jourdon, Paris, for a carriage that cannot be overturned, called *douillette d'aplont*—5 years.

Louis Favre, Marseilles, for the making of soap without fire, by means of pure artificial soda, or his salt of soda, and pure olive oil.—5 years.

Andre Millet, merchant, Paris, for a *portraitive* chimney—5 years.

Gabriel Vandemerghel, brewer, Armentieres, for a method of making white beer, as at Louvain—15 years.

Auguste Moineau, clock maker, Paris, for a movement of indestructible pressure applicable to machinery as well as clocks, called *à la moineau*—15 years.

Jean Baptiste Barnard Maitre Humbert, Jean Baptiste Charlemagne Louis-Bazile, and Adlren Chenot, Chatillon sur Seine, for a process of obtaining iron with economy of fuel, without previously melting the ore or dross—15 years.

Martial Theuvoit, innkeeper, Autun, for a machine for stretching the cords of musical instruments—10 years.

Jean Alphonse Camme, mechanician, Malannay, for improvements in the cogs of pulleys, for sea service—5 years.

Charles Frederic Baer, coach-builder, Strasburg, for a method of turning a carriage round short, by means of the fore wheels moving with hinges—5 years.

Gautier, Nantes, for the preparation of, and method of preserving butter—5 years.

Sebastien Prefaut, turner, Nevers, for a press adapted to every purpose where pressing is required—5 years.

Mury, Paris, for improvements in making clogs—5 years.

Louis Jean Pierre Jomard, Valence, for a method of surveying by means of an instrument called a *tact-Graphique*—5 years.

Michel Grand, spinner, Marseilles, for a machine called a *balantier moteur*—5 years.

The Turf Pit Company at Crony-sur-Ourcq, for improvements in the oven for preparing peat—5 years.

Achille de Barnardière, manufacturer, Paris, for a method of making fine baskets and cane work with strips of whalebone—5 years.

Christophe Francois Martin Dillemann, manufacturer, and Jean Michel Reiuhardt, mechanic, Strasburg, for a horizontal bobbin, with vertical pressure, for spinning cotton—10 years.

Alexis Bruno Gensoul, physician, Bagnols, for a method of warming the pans for spinning the silk cacoons with economy of fuel—10 years.

Pierre Revon, mechanic, Paris, for a steam engine adapted to carriages and vessels of all descriptions—10 years.

Caiman Duverger, architect, Soisy sur Etiolles, for a new syringe, called a *clysoir*—5 years.

Etiemne Lasgorsieux, mechanician, for improvements in the construction of machinery for opening, and preparing, and spinning wool, silk, hemp, flax, &c.—10 years.

Francois, junior, and Bernoit, builders, Troyes, for a lithographic press, with cylinders—5 years.

John Neale and Alexander Cowan, Nancy, for a method of preparing and passing cotton and thread through steam—5 years.

Penelet, father and son, watchmakers, Paris, for an instrument called *compteur de physique et d'astronomié*—15 years.

Louis Joseph Pelleport, and William Poupier, Jeanne Antoinette Selos, Paris, for a method of rendering stuffs and paper of all colours water-proof—5 years.

John Neale and Alexander Cowan, engineers, Nancy, for a mechanical loom which prepares its own warp—5 years.

Antoine George, silk knit manufacturer, Lyons, for a machine for making bricks—5 years.

Pierre Monuet, the son, brandy distiller, at Grand Gallargues, for an apparatus for distilling wines and the dregs of grapes—10 years.

Pierre Fasanini, merchant, Lyons, for a machine for weaving stuffs of all kinds, and which stops when the woof or warp breaks—10 years.

Jean Baptiste Langlois-Quignolot, purse-maker, Paris, for a new stitch, called *point de tulle* or *point à jour*, in making purses, worked by machinery—5 years.

Saint Maurice Cabany, merchant, Paris, for a machine for making a coating of gold or silver, or any other matter, with variegated colours, adapted as ornamental borders, &c. which may be pasted or glued to bronzes, pasteboard, and cabinet works, &c.—15 years.

Matthias Levi Lauzenberg, Morocco-leather manufacturer, Strasburg, for a method of separating in two the skins of calves and goats —10 years.

Pierre Jacques Debezis, Paris, for an elastic bathing tub, called *baignoires dormeuses*—10 years.

Queries by Correspondents.

Mr Editor,—I would wish, through the medium of your Journal, to be informed of the proper number of wheels, and their diameters, to drive different machines with a 15 inch pulley on, to revolve 165 revolutions per minute, from a water wheel 15 feet in diameter, the periphery of the wheel to run 3.37 feet per second. It will, of course, be necessary to give the diameter of the drum, on the horizontal shaft, that drives the pulley on the machine. I would wish those that will take the trouble to make this calculation, would give the proper pitch of the different wheels, allowing the water wheel to be equal to 12 horse power.

An Inquirer.

A citizen of New Jersey wishes to be informed through the medium of the Franklin Journal,

1st. Upon what principle the draft of air furnaces depends?

2nd. What effect an increased height of the chimney will have on the draft?

3d. If an increased height of the chimney increases the draft, what is the ratio?

4th. What effect an increase or diminution of the superficial area of the chimney will have on the draft?

5th. Will a chimney largest at its top, or vice versa, make the strongest draft?

6th. Is it important, as regards the draft, that the materials of which a chimney be composed, be good conductors of heat, or otherwise?

7th. What is the best mode of binding the chimney of an air furnace, to prevent its cracking?

A correspondent has a water fall, head 8 feet—what construction of water wheel is best adapted to gain the full effect of this fall?

Information is requested on the best mode of erecting a trip hammer, together with the proper fall and velocity for any given weight, say 300 lbs.

A subscriber wishes to know what is the best construction for Barker's mill; and what is the maximum power that can be produced by it.

Suppose A C to be a log of any length, of equal diameter throughout: one man sustains the log at A, two men with a porter, or bar, at B, what must be the relative position of the porter at B, in order that every man shall sustain an equal weight?